1981

A Comparison of the Early Social Behavior of Twins and Singletons.

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A COMPARISON OF THE EARLY SOCIAL BEHAVIOR OF TWINS AND SINGLETONS

The Louisiana State University and Agricultural and Mechanical Col. PH.D. 1981

A Comparison of the Early Social Behavior of Twins and Singletons

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

by
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May 1981

Acknowledgements

I wish to express my sincere appreciation to a number of people who have kindly offered their assistance on this project.

First, a special thanks is extended to the members of my dissertation committee - Dr. Nathan Gottfried, Dr. Robert Coon, Dr. Ralph Dreger, Dr. Bill Seay, and Dr. Don Williamson - each of whom not only served on my committee, but also have greatly influenced my development as a psychologist during the course of my doctoral training. A special note of appreciation is due Dr. Gottfried, my major professor, for his guidance in directing this work, and for his support, encouragement, and patience.

I am very grateful to those members of the Baton Rouge Mother's of Twins Club and their young twin children who kindly volunteered to participate in this study. Thanks is also extended to those mothers of singletons and their young children who participated as well.

I am indebted to Steve Buco and Pat Cawunder for their expert assistance in the computerized analyses of the data obtained in this research.

A special note of appreciation is extended to Pat Hives for her time and care in typing (and retyping) this manuscript. Also, as secretary of the Developmental Psychology Center where this study took place, she always made sure everything went smoothly.

I wish to acknowledge Dr. Suzanne Hill, professor of Psychology at the University of New Orleans, who originally stimulated my interest in the study of developmental psychology as an area of specialization.

I am most appreciative of my friends and fellow graduate students - Randy Elkins, Al Buxton, Carol Cohen, and Becky Marcon - each of whom have offered their assistance and moral support during this study.

Finally, this project and my doctoral degree could not have become a reality without the support and care of a very patient and loving family. I am deeply grateful to my parents, Mr. and Mrs. Roland F. Lemoine, for providing me with the opportunity to seek this level of training and for their confidence in my ability to attain my goals. Most of all, I thank my wife, Gloria, and my daughter, Angela, whose faithful love, patience, and support encouraged me all along the way.

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Abstract

This study was a comprehensive descriptive comparison of the early social behavior of twins and singletons in a playgroup situation. Eight pairs of same-sex female twins and 16 age-matched female singleton children, ages 17 to 43 months, participated as subjects. Playgroups composed of one pair of twins and two same-age unfamiliar singletons met for two free play sessions with their mothers present. A wide range of observational measures were recorded using a behavior categorization system. Twin-singleton comparisons were made between the four younger playgroups (mean age two years) and four older playgroups (mean age three years). Twins and singletons were compared both as initiators and as objects of social contact and interaction. The playgroup situation afforded study of twin-singleton differences in both mother-directed and child-directed social behavior, as well as the role of twin-cotwin social contacts in these areas.

Results indicated twins and singletons differed in both their mother-directed and child-directed social behavior. These differences were most evident in comparing younger versus older playgroups. There was little indication of twin-singleton differences at the older age level. Observational data suggested twinship afforded twins security away from their mothers in a novel play setting, thereby increasing their availability for social contacts with singleton peers. Results did not support previous proposals that twins' close relationship with each other isolates them from social contacts with other playmates or reduces their interaction with their mothers.

INTRODUCTION

In recent years there has been increasing interest in early sibling interactions and the role siblings play in social development (Ambramovitch, Corter, & Lando, 1979; Dunn & Kendrick, 1979; Lamb, 1978a, 1978b; Samuels, 1980). This trend follows recognition that there are few studies describing the early social behavior of siblings, a situation that contrasts with the substantial body of information about mother-child interaction, and, recently, young children's social relations with fathers (e.g., Lamb, 1976) and peers (e.g., Lewis and Rosenblum, 1975; Meuller & Vandell, 1979). Since siblings often provide the first extensive social experiences outside of the parent-child relationship, knowledge of the developmental influence of sibships is crucial to an understanding of the processes occurring within the young child's social network of parents, siblings, and peers.

Sibships vary according to a number of variables, such as the number, sex, ordinal position, and age-interval between siblings. The age-interval between siblings is particularly important since the accompanying differences in developmental level likely affect the characteristics of sibling interactions, as well as siblings relations with others. White (1975) has suggested that close age-spacing between siblings has negative consequences on sibling and mother-child interactions, perhaps due to the increased competition for attention. Wagner, Schubert, and Schubert (1979) have drawn

similar conclusions based on their review of studies of age-spacing effects on psychosocial traits in school age and adult sibling-pair members. However, it is unclear at what stage of development the age-spacing variable has impact. Moreover, it is difficult to assess the effects of sibling's age-interval apart from other sibling constellation variables (e.g., number of siblings, sex of pair members, etc.). Ambramovitch's et al. (1979, 1980) recent study of the early social interactions between sibling-pair members indicated that the age-interval (small versus large) between siblings has almost no effect on the characteristics of their social behavior. In addition, young sibling interactions were not based predominantly on rivalry.

Perhaps the most unique of all sibships is that of twins. Twins are unique in that the age-interval between them is virtually zero, their ordinal positions identical, and their developmental levels are more similar than is the case for any other sibship. In addition, twins are likely to progress through stages of development at approximately the same time. These factors make twins a particularly valuable sibship for developmental study. Twins' social behavior provides a special case from which to judge the effects of age-spacing and ordinal position on social development.

In her book Twins and Twin Relations, Koch (1966) notes there has been considerable speculation about the impact of twins relationships with each other. For example, it is alleged that twins are closer than are other siblings and experience more jealousy and rivalry. In addition, it has been said that twins develop dominant-

submissive roles in their interactions with each other. One twin becomes the more active, assertive twin while the other becomes the more passive, submissive twin. There is also a folklore that twins develop their own private language of unique words and gestures ("cryptophasia") to communicate exclusively with each other in early childhood (e.g., Mittler, 1970; Zazzo, 1969).

The closeness of twins' relationship is alleged to affect their interactions with other persons as well. A popular notion is that since twins spend most of their time together, their interactions with their parents are curtailed and this reduces the quality of the parent-child relationship. The close social ties between twins could also isolate them from social contacts with their peers. The argument is that twins strongly prefer each other's company and are less responsive to, or initiate less action towards other children. There has also been concern that twins' competitiveness or dominant-submissive roles may generalize to their interactions with other playmates. Overall, these factors may have negative consequences for twins' social development.

While the possible negative consequences of twinship have received most attention, there has also been speculation about positive social consequences. For example, twins' early and continuous companionship may provide a 'head-start' for acquiring prosocial behaviors (e.g., sharing, cooperation, altruism) which could transfer to their interactions with others. In this regard, it is of interest to note that current conceptualizations of early peer relations emphasize the importance of the development of reciprocity and synchrony

in interchanges between age-mates (e.g., Cairnes, 1979). Since twins developmental levels are very similar, the 'twin situation' could provide early 'peer-like' experiences which promote development of interaction skills. The age-mate sitmulation twins receive by virtue of their unique sibship could provide an optimal balance of assimilative and accomodative social experiences, and these experiences could promote acquisition of age-mate social schemes and perspective-taking skills (Note: Bronson, 1975; Lee, 1975, and others have discussed the importance of the development of social schemes in early interactions with peers).

Despite much speculation about twins, there has been litte systematic investigation of the effect of twinship on social behavior. Most psychological studies that have involved twins have not focused on twinship per se. Rather, studies have capitalized on twins' unique biological relatedness in order to evaluate the relative effects of heredity and environment in the development of mental traits or mental disorders (Kallman, 1953, Loehlin & Nichols, 1976; Nance, 1978). The following section is a critical review of the few available studies of twins' early social behavior. The studies discussed have been divided into two broad groupings; namely, those reporting negative social consequences of twinship and those reporting positive social consequences of twinship.

Literature Review:

Studies reporting negative social consequences of twinship.

Dorothy Burlingham (Burlingham, 1952, 1963) apparently was the

first researcher to undertake systematic study of the social behavior of young twins. She kept detailed longitudinal records of three pairs of identical twins who were residents of the Hamstead Nurseries, a residential war home. The twins were observed from early infancy through early childhood. Characteristics of their interactions with each other, their playmates, parents, and the staff were recorded. Observations indicated that twins were aware of each other's presence from an early age and soon competed for attention from the staff. In one pair of twins, envy and jealousy in regard to their mother was pronounced. It also appeared that twins competed with each other in their early developmental accomplishments. Despite these apparent conflicts, twins showed much difficulty in being separated from each other and typically acted as a "team" in relating to others and in playing together. They established active/passive roles in their relationship and tended to maintain these relative roles throughout their early childhood.

Based on these observations, Burlingham concluded that twinship may have "pathological" consequences for the individual social development of twins. She noted that young twins showed more acute rivalry than is typical for single born siblings and that this rivalry was manifested at an early age. In addition, twinship produced an overly strong "bond" between the children which weakened their relationship with their relationship with their mothers and others.

Luria and Yudovitch (1959) have also described an overly close relationship that developed between a set of identical twins. The five-year-old twins studied showed a strong preference for each

other's company and rarely interacted with other children or adults. Although there was no evidence of mental retardation, the twin's showed severely delayed speech, and their object play was primitive and monotonous. It is interesting to note that this twin pair used "autonomous speech" and lively gesticulation in private communication. Luria and Yudovitch speculated that the closeness of the "twin situation" was responsible for these characteristics. They reported that these twins showed considerable improvement in all areas when they were separated in kindergarten and given the opportunity to interact with other children independently.

The findings of Burlingham (1951) and Luria and Yudovitch (1959) are likely not representative of typical twin development. In both studies, the twins observed were residents of nursery homes and had been separated from their parents except for occasional visits. Consequently, the negative consequences of twinship observed by these investigators may have been less a result of the "twin situation" alone, and more related to their lack of opportunity to establish a normal mother-child relationship. Burlingham herself emphasized the importance of a normal mother-child relationship in preventing the twin-sibling "bond" from becoming excessive.

Paluszny and Gibson (1974) conducted a study of twin social behavior in which the subjects apparently had normal mother-child relations. The subjects were 10 pairs of three to four-year-old fraternal twins who lived at home with their parents and attended the same nursery school. Data were obtained from observations made by teachers and staff who kept daily records of the activities of all the children in the school.

Paluszny and Gibson found that the 10 sets of twins could be divided into three groupings, according to the type of dependency relationship they manifested with each other. One-half of the twin pairs showed either a form of mutual dependency or strong preference for each others company, experienced much difficulty in separating, and in relating to peers. One set of twins showed intense rivalry and competition for friends. In all cases, however, these characteristics declined over the length of time the twins remained in school. Of the remaining five pairs of twins, two showed a one-sided form of dependency in which one twin was "extremely dependent" on the other. In both cases, however, the dependent member was a handicapped child. Finally, the other three pairs showed little evidence of mutual dependency. They separated easily, readily engaged in play with peers, and developed independent friendships.

Paluszny and Gibson speculated that the mother-child relationship played an important role in the mutual dependency observed in half of the twin sample. They observed that the mothers of the mutually dependent twins showed difficulties in separating from their children when they brought them to school. Also, these mothers encouraged their twins' similarity and dependency more than did mothers of twin pairs showing minimal dependency. Thus, the strong dependency relationships of the five twin pairs may have been related to their mother's over-involvement with them. This conclusion is in keeping with the notion that negative effects of twinship are seen primarily in those twins in which a normal mother-child relationship has not been established.

It should be noted that Paluszny and Gibson's study show methodological weaknesses which warrant caution in accepting their conclusions. Paluszny and Gibson relied on anecdotal records. There was no non-twin comparison sample. Thus, it is possible that their pre-conceived notions about twin behaivor and development may have biased the interpretations and conclusions they drew from the anecdotal records of twins' social interactions. The reference to Burlingham's work and other literature reporting psychoanalytic therapy with twins suggests that these investigators may have had a bias toward finding pathology in evaluating twin behavior.

Lytton, Conway, and Suave' (1977) have conducted a carefully executed study of the effects of twinship on parent-child interaction. They conducted home observations of 46 same-sex male twins and a matched sample of singletons who had a sibling close in age (within 3 years). The subjects were two-and-one-half years of age and from intact middle-class and working-class families. A behavior category coding system of pre-defined, reliably observable behaviors was used to record parent-child interactions. Parents and children were also given ratings based on observations, diaries kept by the subjects' mothers, and interview information. Variables under study included child compliance, attachment/independence, and language development.

Lytton and co-workers found that twins experienced fewer verbal interchanges with their parents than did non-twin siblings. They received fewer directions, and their parents did not follow through with rules and prohibitions as consistently as did parents of singletons. Twins also experienced less affection and positive actions

(e.g., kiss, hug, praise, approval) from their parents as well as less negative actions (e.g., threats, refusals, withdrawls of love). Twin-singleton differences were also evident in the children's behavior. Twins were generally less active, produced less speech, and showed a higher frequency of attachment behavior (i.e., primarily approaches to their mothers). While twins' speech was rated as less mature, there was no evidence of "cryptophasia", the private language of twins.

Results of their study led Lytton and co-workers to conclude that parents of twins are "less involved" with their children than are parents of singletons, perhaps due to the relative "cohesion" of twin pairs and the greater demands on twin parents' time. The authors state that twins' greater degree of attachment behavior may be related to their need to reassure themselves of their parents' love.

Lytton et. al.'s data showed that twins experienced less affection and less negative actions from their parents in comparison to singleton siblings. Thus, there was less overall parent-child interaction for twins than for singletons. This may have simply been an indication that twins spent most of their time away from their parents playing together. Singleton siblings may have been independently more available for interaction with their parents and, therfore, showed a higher frequency of all types of parent-child behavior. It is interesting to note that singletons actually showed a significantly higher attachment behavior rate (frequency of occurrence per minute) as compared to twins. Yet Lytton et al. attributed this to singletons overall higher level of activity.

The final study discussed in this section addresses twins interactions with peers. Kim and co-workers (Kim, Dales, Conners, Walters, and Witherspoon, 1969) conducted a longitudinal study of young twins peer interactions from age three-and-one-half to age six, at six-month intervals. Thirteen pairs of identical twins and 22 singleton controls (matched by age and sex) were observed during their free-play activities in nursery school and kindergarten settings. Using a time-sampling procedure, three broad categories of behavior were recorded: A) Affectional behavior (i.e., warm regard, friendlines, sympathy, or helpfulness); B) Aggressive behavior (i.e., threats and attacks, both verbal and physical); and C) Solitary Play. Affectional and aggressive behaviors were coded as either contacts or responses, depending on whether the behavior was initiated by the focus child, or was a reaction to another child's behavior, respectively.

Results of Kim's et al. observations indicated that young twins showed significantly less affectional and aggressive behavior toward their peers and engaged in more solitary play than did singleton controls. Also, twins made fewer contacts and responses. These twin-singleton differences sharply decreased with age, and there were no group differences in any category of behavior by age five-and-one-half. The major group differences observed were at the youngest age level of three-and-one-half. Kim et al. speculated that the increased social experiences provided by the school environment reduced the early effects of twinship over the preschool years.

The finding that twins showed less contacts and responses as compared to singletons suggests they showed an overall lower frequency

of peer-interactive behavior regardless of whether these interactions were affiliative or aggressive. It is unclear whether this result simply reflects that twins played more with each other than with their peers, since the frequencies of twin-cotwin interactions was apparently not recorded. Nevertheless, Kim et al.'s study illustrates the importance of age (and possibly peer experience) as a variable influencing the effects of twinship. Kim et al.'s data suggest the impact of twinship on social behavior in more pronounced in early childhood.

Studies reporting positive social consequences of twinship.

Koch's (1966) book, Twins and Twin Relations, provides the most comprehensive source of information on the social behavior of young twins. In this publication, she reports results of research on a sample of 90 pairs of five and six-year-old twins and a carefully matched sample of singleton controls (who had siblings close in age). Koch investigated characteristics of twins' relationships with each other, their parents, and their peers through pre-planned interviews with the subjects' mothers, teachers, and the children themselves. She also administered a number of psychometric instruments (e.g., Children's Apperception Test) and teacher rating scales. Koch studied the effects of zygosity and gender composition of the twin pair (i.e., same-sex versus opposite sex males and females) on the characteristics of twins attitudes and behavior. Only her general findings will be discussed here.

Results of various measures indicated that twins were closer in their relationship than were singleton siblings. They tended to play together more and to share friends and possessions more and with less conflict. There was little evidence that twins were exceptionally rivalrous or competitive with each other or that attitudes such as these generalized to interactions with others. Nor did the closeness of the twin relationship reduce their involvement with their parents or peers. In fact, measures of twins' closeness correlated positively with measures of their involvement with other children and their rated affectionateness. Also, for twin girls from same-sex pairs, measures of the closeness of their relationship indicated twinship increased peer interaction. Koch warned that this latter result does not necessarily mean that twinship increased this subgroups sociability, since it is possible that other children take the initiative of interacting with twins because they appear to be special types of children. It is important, then, to consider both twins' initiation of interaction with peers as well as their peers interaction with them in evaluating twins sociability.

Interviews with the twins' mothers indicated that in over half of the pairs studied, there was a clearly recognizeable and relatively stable dominance-submission relationship. These relative social roles were expressed more by the twins social skills rather than by the physical prowess of one over the other. There was little evidence that the relative roles twins played in their relationship with each other generalized to their interactions with other playmates, although the data showed some tendency for submissive twins to play alone or with a younger child more often.

Koch's general conclusion from this comprehensiye analysis was that twinship has little or no significant effect on twins' social development. The few twin-singleton differences found were generally in the direction of positive social consequences. It should be noted, however, that Koch's sample of subjects was a very selective and limited age-grouping of twins who were generally older than subjects in studies reporting negative social consequences. As suggested by the previously discussed longitudinal study by Kim and co-workers (1969), twinship effects may be more evident during early childhood, when twins possibly spend more time together and apart from their parents and peers. Nevertheless, these two studies indicate twins' social behavior is comparable to singletons by the time they are of school age.

The remaining evidence for the positive social consequences of twinship comes from primate research. Deets (1974a, 1974b) has published a series of articles on the social behavior of rhesus monkey twin-siblings. The twin-sibling relationship was produced by experimental manipulation. Eight twin pairs were formed by fostering unrelated singleton newborns, two to a mother. A control group of non-twins was formed by fostering four singleton newborns, one to a mother. All monkey infants were males and had been separated from their biological mother shortly after birth. The monkeys were studied in a play-pen situation in which the living quarters adjoined a common play area. A small passage way which connected the living quarters to the play area restricted mothers to the living cage, yet allowed infant monkeys to move freely between the two areas. Four unrelated, age-matched infant monkeys were placed in the play area on a daily basis. These

monkeys were "stimulus infants" who served as partners for peer interaction. Deets recorded mother-infant, infant-peer, and sibling interactions through the use of a behavior categorization system.

Deets found that positive affiliative behavior (e.g., contact play, explore-groom, imitate) began earlier within the twin-sibling pair and remained at high levels throughout the seven-month period of observation. Twin-siblings also engaged in more positive affiliative behavior with peers (stimulus infants), while singleton infants more frequently engaged in solitary activities (e.g., self-groom, self-play). Singletons also displayed more aggressive and submissive behaviors (e.g., threat-grimace, withdrawal) and exhibited more distress (e.g., screech-distress) than did the twins. Deets interpreted these findings as evidence that the age-mate stimulation provided by the twin situation increased twins' gregariousness as well as mitigated their expression of aggressive behavior.

Twinship effects were also evident in mother-infant interactions. Deets found that twin-siblings made fewer social contacts with their mothers than did the singleton monkeys. In addition, the twins' mothers spent less time cradleing them, and also directed less rejection and negative behavior toward them. Deets argued that the twin-singleton differences in the mothers of twins' behavior were more an indirect result of differences in their infants behavior and characteristic of twin mothers' maternal behavior. He suggested that twin-siblings played an important role in the maternal attachment/independence process. That is, twins' relative "cohesion" and companionship may function to draw them away from interaction with their mother, thereby reducing the need

for their mothers to initiate emancipation efforts towards them (hence, the finding of less rejection and negative behavior). In addition, the presence of a cotwin may prevent the maternal attachment bond from becoming as tenacious as it does in singletons, and this further reduces the need for twin mothers to initiate emancipation of their infants. Thus, while twins show less interaction with their mothers, this could have the positive result of an earlier and easier transition from maternal dependency to independent social functioning and increased availability and receptiveness to peer interaction.

Deet's study indicates twinship may have the positive effect of fostering development of twins' independence from their mother and increasing their affiliation with peers. While generalizations from primate data to the more complex human situation must be made with caution, Deet's study provides a fascinating perspective on twins' early social development, as well as providing a converging source of evidence of the possibly positive effects of twinship.

The Present Study

Results of previous studies have generally indicated that twinship may have special consequences for the development of social behavior by affecting the maternal attachment/independence process, early peer interaction, and the sibling relationship itself. Several studies have indicated that twinship may have a negative impact in these areas; however, most research has been methodologically weak or limited in other ways, such that conclusions based on their findings are very tentative. Additional comparisons of the early social behavior

of twins and singletons are needed in order to better evaluate the effects on twinship on development. Further knowledge in this area is valuable not only because it increases our understanding of twins as individuals, but also because twinship represents somewhat of a baseline from which to judge the effect of sibship variables such as the age-spacing and ordinal position on social development.

The present investigation was a comprehensive descriptive analysis of twins' early social behavior. The study focused on twin-singleton differences in mother-directed and child-directed behavior and the role of twin-cotwin interactions in these areas. Playgroups composed of one pair of twins and two unfamiliar singleton children met for two free-play sessions in which the mothers were present. The playgroup situation afforded study of the patterning and characteristics of twins' interactions among three classes of social partners: mothers, cotwins, and peers. Child-directed behavior analyses also provided an evaluation of twins as initiators and objects of peer interaction.

A wide range of observational measures of child behavior were recorded. These measures provided comparisons of twins and singletons along several general dimensions: namely, A) initiating, maintaining, and terminating social contacts (e.g., social approach, proximity, withdraw); B) general affective quality of social contacts (e.g., positive contact, negative contact); C) amount and types of object-centered interactions (e.g., offer toy, take toy, show toy); D) amount and type of verbal/expressive behavior and use of non-verbal communicative behavior (e.g., verbalize, vocalize, gesture); E) amount of imitative and self-directed behavior (e.g., imitative manipulation of toy, oral contact with

self); F) amount and type of toy manipulation and handling (e.g., manipulate toy, throw toy); and G) play posture and movement (e.g., sit, crawl, walk, run). The observational procedure and measures employed were comparable to those used in recent studies of sibling, peer, and mother-child interaction (e.g., Brooks-Gunn and Lewis, 1979; Lamb, 1978a; Mueller and Rich, 1976).

The subjects in this study were between one-and-one-half and three-and-one-half years of age. This age interval is particularly suitable for studying twinship effects on mother-directed and child-directed behavior, since during this time young children typically show reduced maternal attachment/dependency behavior and an increase in interactions with peers.

Method

Subjects

Eight pairs of same-sex female twins and 16 age-matched female singletons served as subjects. These children were between the ages of 17 and 43 months. Twins were recruited through the Baton Rouge Mothers of Twins Club. Six twin pairs were identical, one pair was fraternal, and the zygosity of the eighth pair had not been determined, according to their mothers. Singletons were recruited through advertisments in the community, and most subjects were located through preschool programs in the Baton Rouge area. Due to the limited subject pool available, no attempt was made to control for variables such as the number, sex, and age-spacing of other siblings or the prior peer experience of the subjects. These variables were left to vary randomly. All subjects were white and from intact middle-class families. Children's participation in the study was completely voluntary.

The subjects were studied as eight separate playgroups. Each playgroup was composed of one pair of twins and two unfamiliar, age-matched singleton children. In order to assess the effects of age as a variable in measures of social behavior, data for these eight playgroups were later partioned into two separate age levels for purposes of statistical analyses. The two age levels consisted on a younger-age grouping composed of the four youngest playgroups and an older-age grouping composed of the four oldest playgroups. The mean age of the younger age group was 23.5 months and the mean age of the older age group was 38.6 months. Table 1 provides the ages of twins and singletons in each

Table 1

Age (in months) of subjects in each playgroup (1-8)

	YOUNGER AGE LEVEL					OLDER AGE LEVEL			
	Twins		Singletons			Twins		Singletons	
1	T1	17	S1	19	5	T 9	34	S 9	34
	T2		S2	19		T10		S10	34
2	T3	21	S3	23	6	T11	36	S11	38
	T4		S4	23		T12		S12	39
3	T5	24	S5	24	7	T13	40	S13	40
	T6		S6	24		T14		S14	40
4	T7	31	S7	28	8	T15	43	S15	42
	T8		S8	34		T16		S16	43
	$\bar{X}$	23.3		24.3		$\bar{X}$	38.3		38.3

T1 through T16 refer to Twins 1 through 16
S1 through S16 refer to Singletons 1 through 16

of the eight playgroups. Appendix A provides additional information on the subjects.

Setting

The study was conducted in a specially prepared room at the LSU Developmental Psychology Center. The room included a 12 x 16 ft. play area bordered lengthwise by observational blinds 4 ft. in height. These blinds partially concealed observers during the play sessions. Figure 1 is a diagram of the research setting showing the play area, locations of the four observers, and seating locations for the mothers of the subjects. Seating locations for each observer and the mothers of twin and singleton subjects were randomly assigned each session.

The play area included a set of five toys arranged on a 5 x 8 ft. area rug. Table 2 is a listing of the set of toys used. This set was selected to provide a variety of play experiences (e.g., stationary, mobile, constructive, expressive), as well as affording various combinations of toy-centered interactions between children (e.g., solitary, parallel, or group play). Three of the toys were represented in duplicate in order to provide the opportunity for both cooperative and individual play (also, it was learned that some twins had duplicate sets of toys at home).

Pre-session procedures

Mothers and their child(ren) arrived at the center; they were greeted by the author and led to a waiting room adjacent to the playroom. Mothers and their child(ren) were introduced as they arrived and then allowed to socialize freely while awaiting other participants. The children were allowed to play with wooden construction blocks and

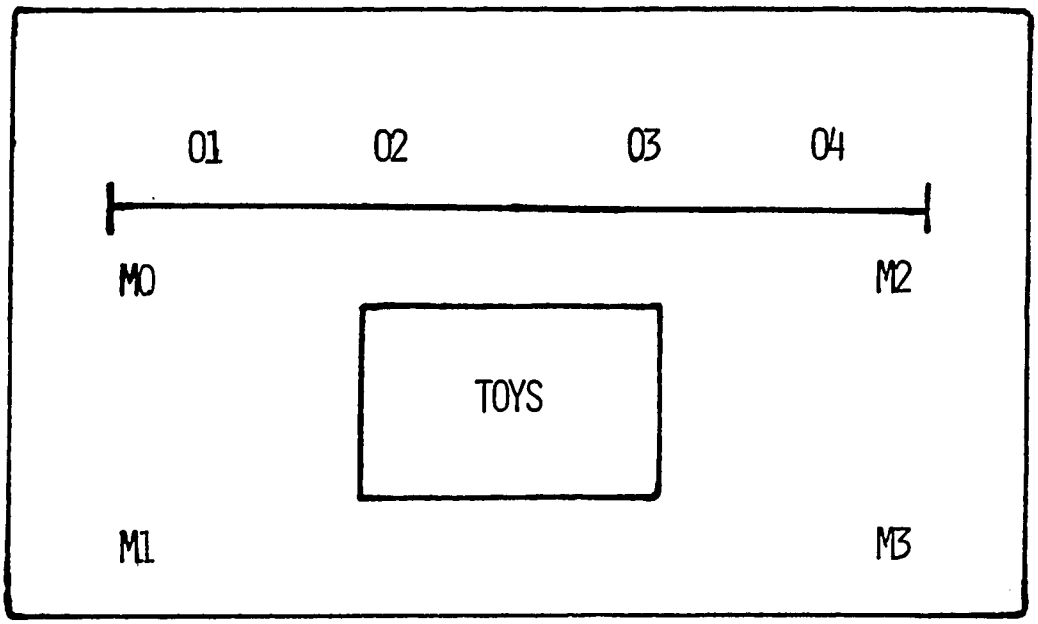

Figure 1. Schematic of the research setting showing the playarea, observer stations (01 - 04), and locations of subjects' mothers (M0 - M3). (⊢⊣ = observational blinds).

Table 2

List of toy items used each play session

(2)	Plastic pails with shovels and beads
(2)	Playschool block wagons with blocks
(1)	Animal hand puppets
(1)	Fisher-Price Playfamily Sesame Street Clubhouse with action figures
(1)	Fisher-Price Playfamily Farm with action figures

drawing materials at a small table provided for them. When all members of the playgroup were present, the mothers were given a brief orientation to the research procedures. It was explained that the observational sessions were free-play periods in which the children were allowed to play together or alone with the toys and persons of their choice. Mothers were instructed to give their child(ren) initial encouragement to play with the toys and other children at the beginning of the session. Thereafter, they were to assume a non-directive role in their child(ren)'s play; that is, they could respond naturally when approached or questioned by their child(ren) during the session, yet they were otherwise to refrain from talk or action with them unless their child(ren) appeared to be in need of special caretaking. In addition, mothers were instructed to allow their child(ren) to remain near them throughout the session if the child(ren) chose to do so after being mildly encouraged to engage in play. In this way, maternal behavior was kept constant between twins and singletons so that the data would reflect primarily differences in child behavior.

During the orientation period, a piece of colored tape was affixed to each of the four children on the front and back of their dresses. Each subject had a different color tape. This facilitated the observer's identification of each child during the play session. This tagging was particularly useful in the case of the twins who on some occasions came to the play session dressed identically.

Following the orientation period, mothers and children were led to the adjoining playroom. After allowing approximately two or three minutes for mothers, subjects, and observers to get settled in the research setting, observational recording began.

Observational Recording Procedures

Each playgroup was observed for a 20 minute free-play session on two separate occasions. Thus, data represent a total of 40 minutes of observation. The length of time between play sessions averaged about a month and one-half and ranged from two weeks to three months.

Four trained observers, each focusing on an individual child in the playgroup, recorded the behavior of the subjects during the sessions. Observers worked in pairs: two observers focused on twin children and two observers focused on singleton children. Observers were randomly assigned to subjects each session. In addition, each pair of observers focused on their assigned child for the first half of the session (i.e., 10 minutes) and then switched to the child that had been observed by his/her co-observer for the remainder of the session. This procedure provided a counter-balance for possible observer effects on observational measures.

Observational data were recorded using a revision of the Behavior Category Observation System (Gottfried & Seay, 1973, 1974; Langlois, Gottfried, & Seay, 1973). This system is a modified time sampling procedure. The ongoing behavior of a child is recorded by writing symbols for pre-specified categories of behavior that occur during each 15-second interval of an observational period. Behavior category symbols are recorded on data sheets in a numbered space corresponding to the 15-second interval during which a sequence of behavior occurred. Only one entry is made for each category occurring in that interval, regardless of its frequency or duration of occurrence. The 20-minute observational period

of this study consisted of 80 15-second intervals. Observers were paced through the recording intervals by a tape recorded number sequence transmitted to each observer via earphones.

The revised observational system includes 37 separate categories representing domains of child behavior such as socially-directed behavior, self-directed behavior, object-directed behavior, and posture and movement. Table 3 is a listing of the behavior categories of the revised system. Appendix B provides category definitions and symbols.

In the revised observational system, designation of the social object of a socially-directed behavior is also coded. In this way, data reflect whether an individual subject directed a particular behavior toward her mother, a singleton child, or a twin child (Behaviors directed toward another subject's mother were not recorded).

In recording child-directed behavior, only the class of social object, twin or singleton, was coded, not the individual child toward whom the act was directed. For example, a given twin subject's symbol for an approach to a singleton did not reflect which of the two available singletons were approached. Likewise, for a given singleton subject, symbols for approach did not reflect which of the two available twins were approached. This procedure was followed in order to keep the data collection task from becoming excessively burdensome for the observers.

Finally, social-object designations for categories of SMILE/LAUGH, FROWN/CRY, VERBALIZE and VOCALIZE were not coded, since previous experience in observing these behaviors has indicated that the person towards whom they are directed is often too difficult to discern in young

Table 3

Category items of the Behavior Category Observation System: Twin project revision

Socially-directed behavior	
Approach	Offer Toy
Withdraw	Accept Toy
Proximity	Take Toy
Non-Specific Contact	Resist Take of Toy
Positive Contact	Verbalize
Negative Contact	Vocalize
Visual Regard	Point
Smile/Laugh	Gesture
Frown/Cry	Imitate Verbalization
Parallel Manipulation of Toy	Imitate Vocalization
Show Toy	Imitate Manipulation of Toy
Self-directed behavior	
Manipulate Self	
Oral Contact with Self	
Object-directed behavior	
Manipulate Toy	Throw Toy
Carry Toy	Oral Contact with Toy
Play posture and movement	
Supine	Stand
Prone	Crawl
Sit	Walk
Squat	Run

children. Similarly, social-object designations for POINT and GESTURE were not coded.

The basic score for a category of behavior is the total of the number of 15 second intervals in which that category occurred. Thus, scores represent a hybrid index of the frequency/duration of each category of behavior. For socially-directed behaviors in which the social-object is designated, three separate scores are computed, one for each social object. There are 80 intervals within the 20 minute observational period. Therefore, per-session category scores ranged from a minimum of zero to a maximum of 80.

Reliability estimates for the majority of the categories in the observational system have been studied previously and reported to be satisfactory (Gottfried & Seay, 1973 - socially-directed categories: $r = .63$ to $.93$; object-directed categories: $r = .63$ to $.97$). The categories, definitions, and procedure are also similar to those used in other current studies of early social behavior (e.g., Brooks-Gunn, & Lewis, 1979; Lamb, 1978a).

Statistical Analyses Performed

The data base consisted of each subjects' total score for each category and session. Data for each category were analyzed separately using a Randomized Block Design Analysis of Variance (ANOVA). The eight playgroups of four subjects each were considered as separate blocks in these analyses. In this way, various sources of variance due to studying the subjects as an age-matched playgroup could be partitioned out of the error term. It was assumed that the children

in each playgroup were relatively more homogeneous in their behavior than if considered as individual subjects randomly assigned within an age level.

Two types of ANOVA procedures were performed. One type of procedure was performed for all mother-directed social categories, as well as all other categories in which social-object was not scored (e.g., MANIPULATE TOY, SIT). These were three factor ANOVA's with repeated measures on one factor (i.e., session) and took the form of BLOCK (8 playgroups) x GROUP (Twin versus Singleton) x SESSION. The second type of analysis was performed on all child-directed (peer/sibling) categories of behavior. These analyses were four factor ANOVA's with repeated measures on one factor and took the form of BLOCK x GROUP x SOCIAL OBJECT (Twin versus Singleton) x SESSION.

Subsequent to ANOVA's, orthogonal contrasts were performed to test statistical differences between the two age levels of children; that is, younger- versus older-age groupings. The four blocks composed of the youngest playgroup-members data were contrasted with the four blocks composed of the oldest playgroup-members data. Interaction effects of Age with Group, Social Object, and Session variables were also computed. In the results sections that follow, the statistical comparisons described are in terms of these two age levels.

In both the ANOVA and contrast procedures, the probability levels chosen for significance testing were $p < .05$ and $p < .01$. Also, a significant trend was indicated by $p \geq .05$, yet $p < .10$. ANOVA procedures were not performed on those categories in which the per-session score means were less than one, since findings based on categories with such a low frequency of occurrence were likely to be spurious.

It should be mentioned that certain peculiarities are inherent in making statistical comparisons of data for a playgroup situation such as the one employed here. These peculiarities are related to the balance of the number of individuals available for social contact across the classes of social object. Specifically, an individual twin child has one cotwin and two singleton peers as potential objects for social contact. Likewise, an individual singleton child has one singleton and two twin peers as potential objects for social contact. This factor must be kept in mind when interpreting results of the statistical analyses. While numerical transformation of the data, such as dividing all twin-singleton and singleton-twin scores by two, might provide some degree of statistical compensation for this situation, it would result in an interpretive problem of considerable magnitude. For example, consider the case where a twin approached her cotwin an equal number of times as she approached a singleton peer. If the data were transformed to reflect the presence of two singletons, the transformed reading would indicate twice as much twin contact, a situation which did not occur. Furthermore, conclusions of such results would have to be stated as 'the approach-twin score was twice that of the mean of the approaches to the two singleton peers.' In view of this situation, it was decided that results of analyses of non-transformed scores requires the least interpretive effort and more closely represents the observed behavior. The non-transformed data presented here reflect the score differences between the <u>classes of social objects</u> without regard to the number of elements within each class.

Results

The following sections describe results for categories of socially-directed behavior, self-directed behavior, object-directed behavior, and play posture and movement. The categories of socially-directed behavior have been organized into two general groupings for purposes of discussion: A) Categories which record initiating, terminating, and maintaining social contact; and B) Categories which describe characteristics of social contact. Results of analyses of mother-directed and child-directed behavior are discussed in each section.

Categories included in the first group are Approach, Withdraw, Proximity, Non-specific Contact, and Visual Regard. These categories reflect movement toward and away from social objects and the frequency/duration of nearness and physical contact with social objects. It should be noted that the first four categories of this group are contingent by virtue of the coding system. For example, the definitions of Approach and Withdraw include the definition of Proximity, thus requiring Proximity to be recorded within the same time interval. However, Proximity scores can further indicate the degree to which social contact with the approached social object has been maintained. Likewise, Non-specific Contact implies Proximity, yet further indicates that some type of physical contact has been made, and can indicate the degree to which such contacts have been maintained. Unlike Approach and Withdraw, Proximity and Non-specific Contact scores do not differentiate the initiator from the social object of the action. For example, if a twin is in proximity to a singleton, the singleton is also in proximity to the

twin, and is scored as such. Finally, the remaining category of Visual Regard is not contingent on the other categories in this group. It is discussed with this group because of its relevance to children's monitoring of a social object of interest. Visual Regard can indicate a more 'distal' form of social contact than Proximity.

The second group of categories includes several subgoups which reflect characteristics of social contacts. The characteristics of object-centered interactions were indicated by categories of Parallel Manipulation of Toys, Offer, Accept, Show, Take, and Resist Take of Toys (note: the definition of Parallel Manipulation of Toys includes Proximity and Manipulate Toy, although each of the later two categories can occur independently of Parallel Manipulation of Toys). The general affective quality of social contacts was indicated by categories of Positive Contact, Negative Contact, Frown/Cry, and Smile/Laugh. Communicative/expressive behavior, both verbal and non-verbal, was indicated by Verbalize, Vocalize, Point, and Gesture. Finally, imitative behavior was indicated by Imitative Verbalization, Vocalization, and Manipulation of Toys.

The ANOVA summary tables for mother-directed and child-directed category scores are provided in Appendices C and E, respectively. Tables of group means and standard deviations for mother-directed and child-directed category scores are provided in Appendices D and F, respectively. The ANOVA summary tables for categories of self-directed behavior, object-directed behavior, and play posture

and movement are provided in Appendix G. Tables of group means and standard deviations for categories in these domains are provided in Appendix H.

The last part of this results section discusses non-statistical comparisons of interest. These comparisons integrate findings from the mother-directed and child-directed behavior analyses and illustrate the patterning of social contact across the classes of social objects for twins and singletons.

Socially-directed behavior:

1. Initiating, terminating, and maintaining social contact.

Mother-directed behavior. Results of analyses of mother-directed behavior indicated significant main effects for categories of Proximity and Non-specific Contact (Group $p < .05$), yet not for Approach, Withdraw, or Visual Regard. Twins scored lower than singletons on both Proximity and Non-specific Contact at both age levels. These results are illustrated in Figure 2A and 2B, respectively. These are graphs of the mean scores for twins (T) and singletons (S) at each age level. Although there appear to be larger score differences at the younger age level, no significant Age x Group effects were obtained.

Analyses of mother-directed Approach and Withdraw scores indicated both twins and singletons scored higher at the younger age level than at the older age level (Age, $p < .01$). Twin-singleton differences by age level were obtained for both categories of behavior (Age x Group, $p < .01$). These results are illustrated in Figures 3A and 3B. The data indicate that in comparison to singletons,

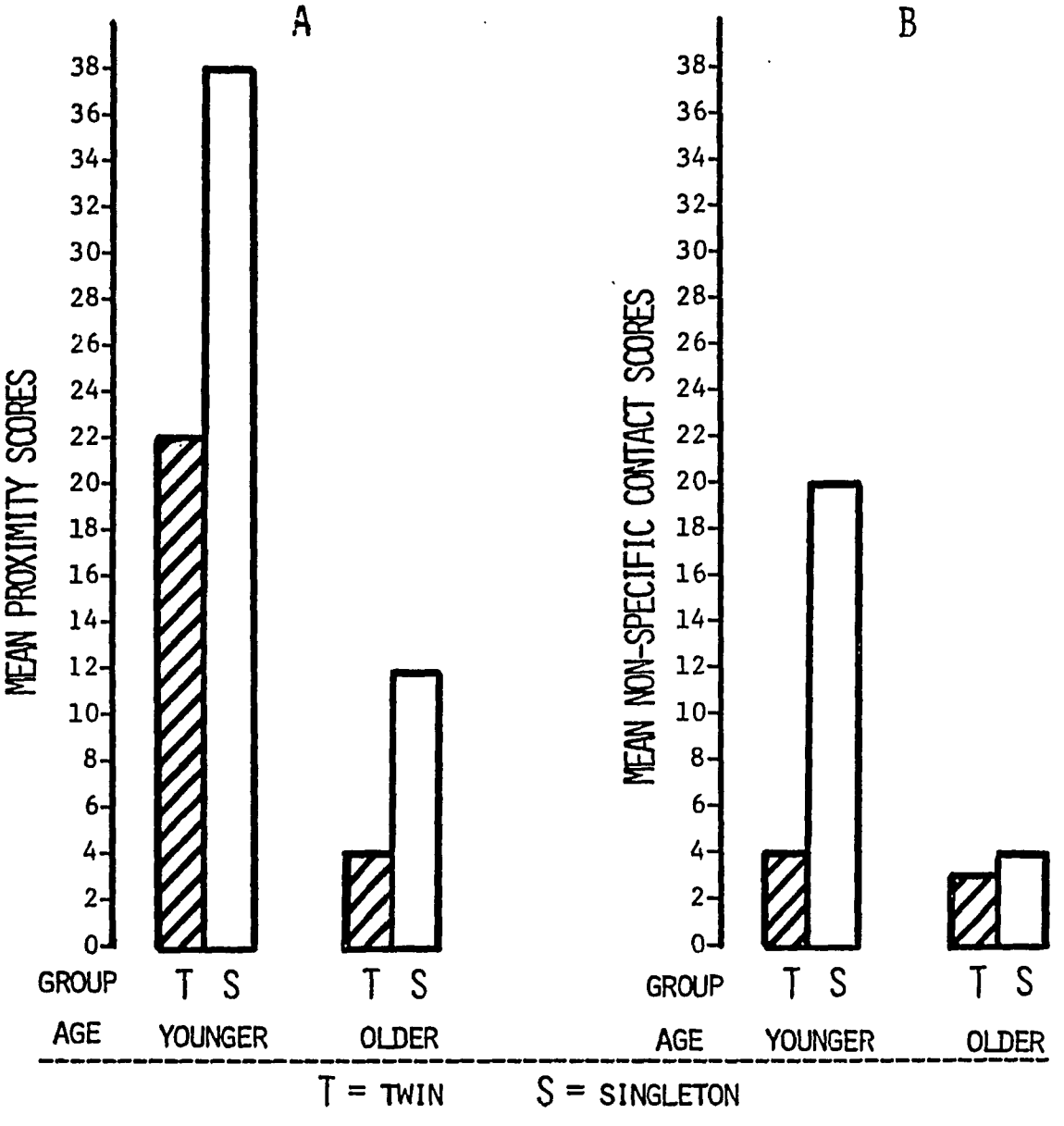

Figure 2A. Mother-directed mean Proximity scores

Figure 2B. Mother-directed mean Non-Specific Contact scores

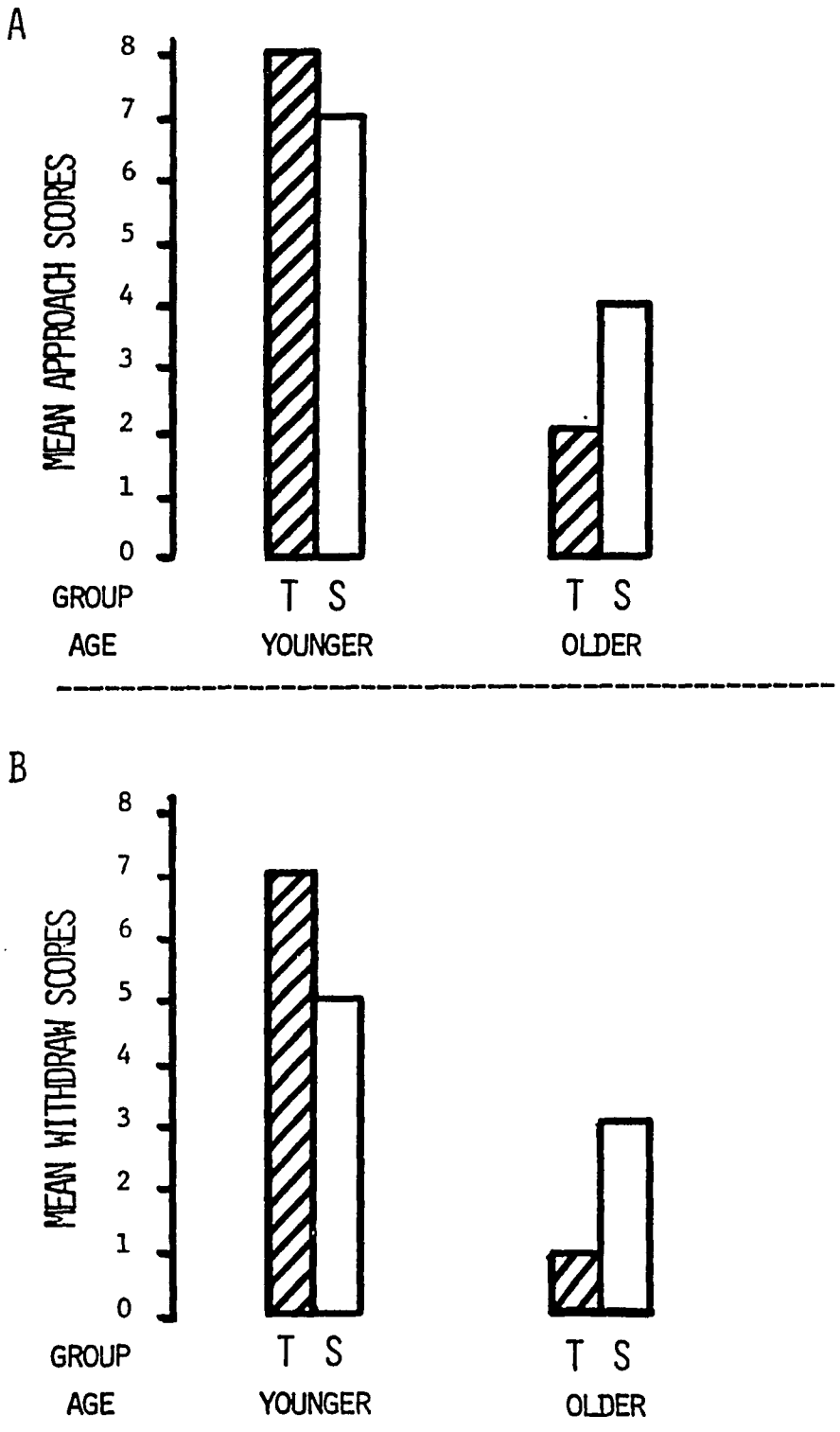

Figure 3A. Mother-directed mean Approach scores.

Figure 3B. Mother-directed mean Withdraw scores.

twins showed a greater decline in mother-directed Approach and Withdraw scores by age level.

Child-directed behavior. Analyses of child-directed categories indicated that twins scored higher in Proximity and Non-specific Contact both as a Group ($p < .05$) and as a class of Social Object ($p < .01$). These main effects were qualified by a significant Age x Group x Object interaction ($p < .05$). Figure 4 illustrates the mean Proximity scores for twins (T) and singletons (S) graphed by Social Object (twin child versus singleton child) at each age level. The data indicated that younger twins scored higher in Proximity to their cotwin (T-T) than in Proximity to singletons (T-S), yet similar score differences were not evident at the older age level (T-T versus T-S). Singletons scored higher in Proximity to twins (S-T) than in Proximity to each other (S-S) at both age levels, with some indication of larger score differences at the older age level. In general, both twins and singletons scored higher on Proximity at the older age level in comparison to the younger age level, yet twin-cotwin (T-T) Proximity scores showed less difference with age than did singleton-twin Proximity scores (S-T).

Although Non-Specific Contact scores showed a pattern of results similar to those of Proximity, a significant Age x Group x Object interaction was not obtained for this category. Analyses of the data did, however, indicate a significant Age x Group interaction ($p < .05$). Results for these effects are graphed in Figure 5. These data indicate that, regardless of the Social Object, twins scored higher than singletons in Non-Specific Contact at both age levels, and twin-singleton score differences were greatest at the younger age level.

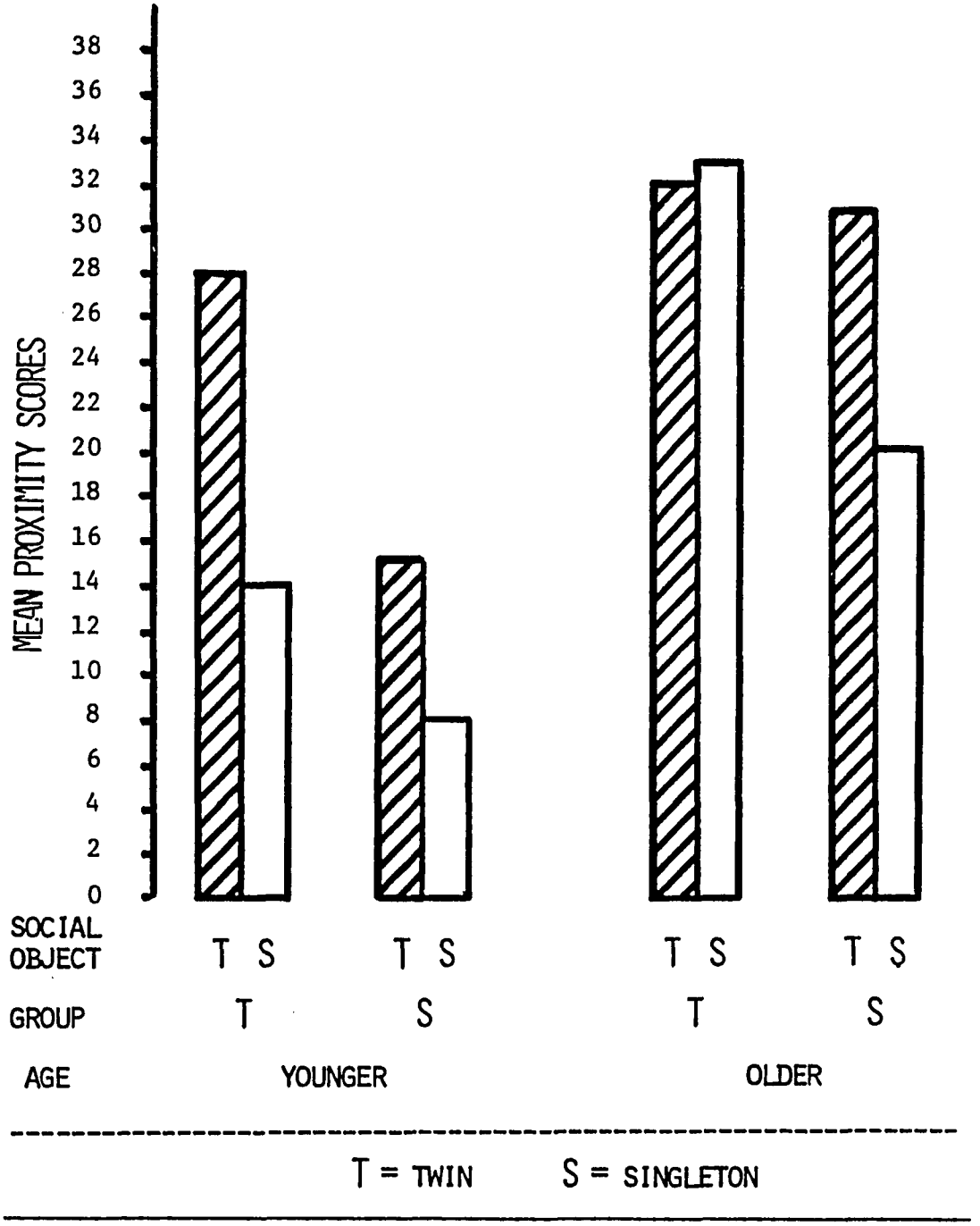

Figure 4. Child-directed mean Proximity scores.

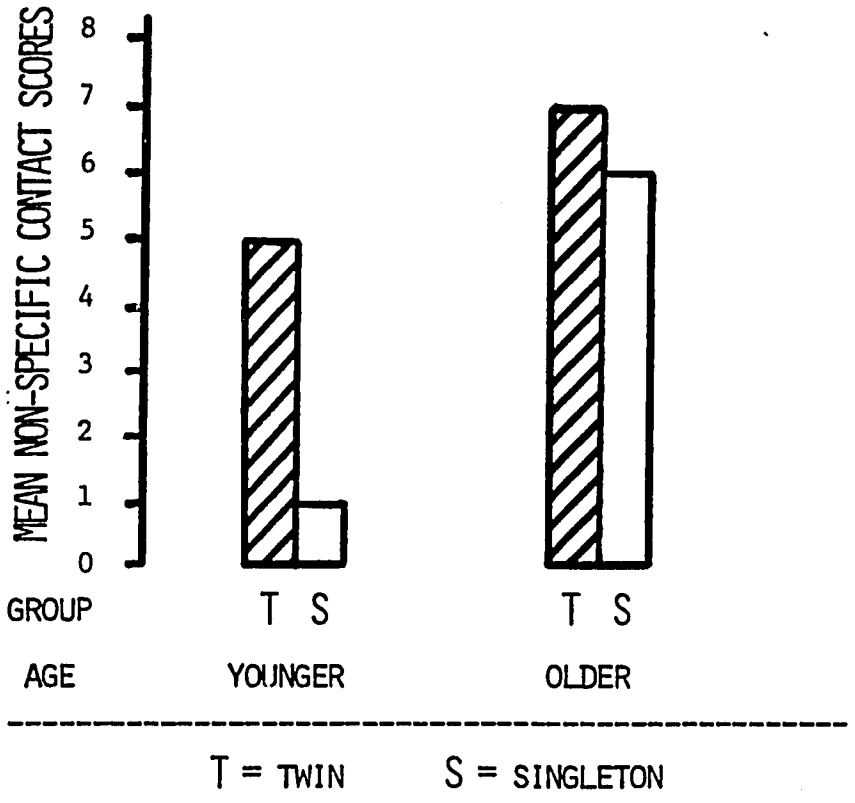

Figure 5. Child-directed mean Non-Specific Contact scores.

Although significant main effects were obtained for Group and Social Object in the categories of Proximity and Non-Specific Contact, Approach scores showed significance for social object only. Withdraw scores showed a significant trend for social object only. Twins scored higher than singletons as Social Objects in Approach and Withdraw at both age levels, regardless of the initiator of the action.

Twins and singletons also differed in their initiation of Approach and Withdraw by age level (Age x Group, $p < .05$). These results are illustrated in Figure 6A and 6B. The Approach data in Figure 6A indicate that regardless of Social Object, younger twins scored higher than older twins, and younger singletons scored lower than older singletons. Withdraw data in Figure 6B indicate younger twins scored higher than older twins, and younger singletons showed a score magnitude similar to that of older singletons.

Finally, in the child-directed Visual Regard category, significant Group ($p < .01$) and Group x Object ($p < .01$) effects were obtained. Figure 7 illustrates mean category scores for twins (t) and singletons (S) by Social Object (twin child versus singleton child). These data indicate that twin scores in Visual Regard of singletons (T-S) were higher than their scores in Visual Regard of their cotwin (T-T). Singletons scores in Visual Regard of twins (S-T) were higher than their scores in Visual Regard of each other (S-S). These data also illustrate that, overall, singletons showed higher Visual Regard scores than did twins, with the highest scores obtained for singletons Visual Regard of twins as Social Object.

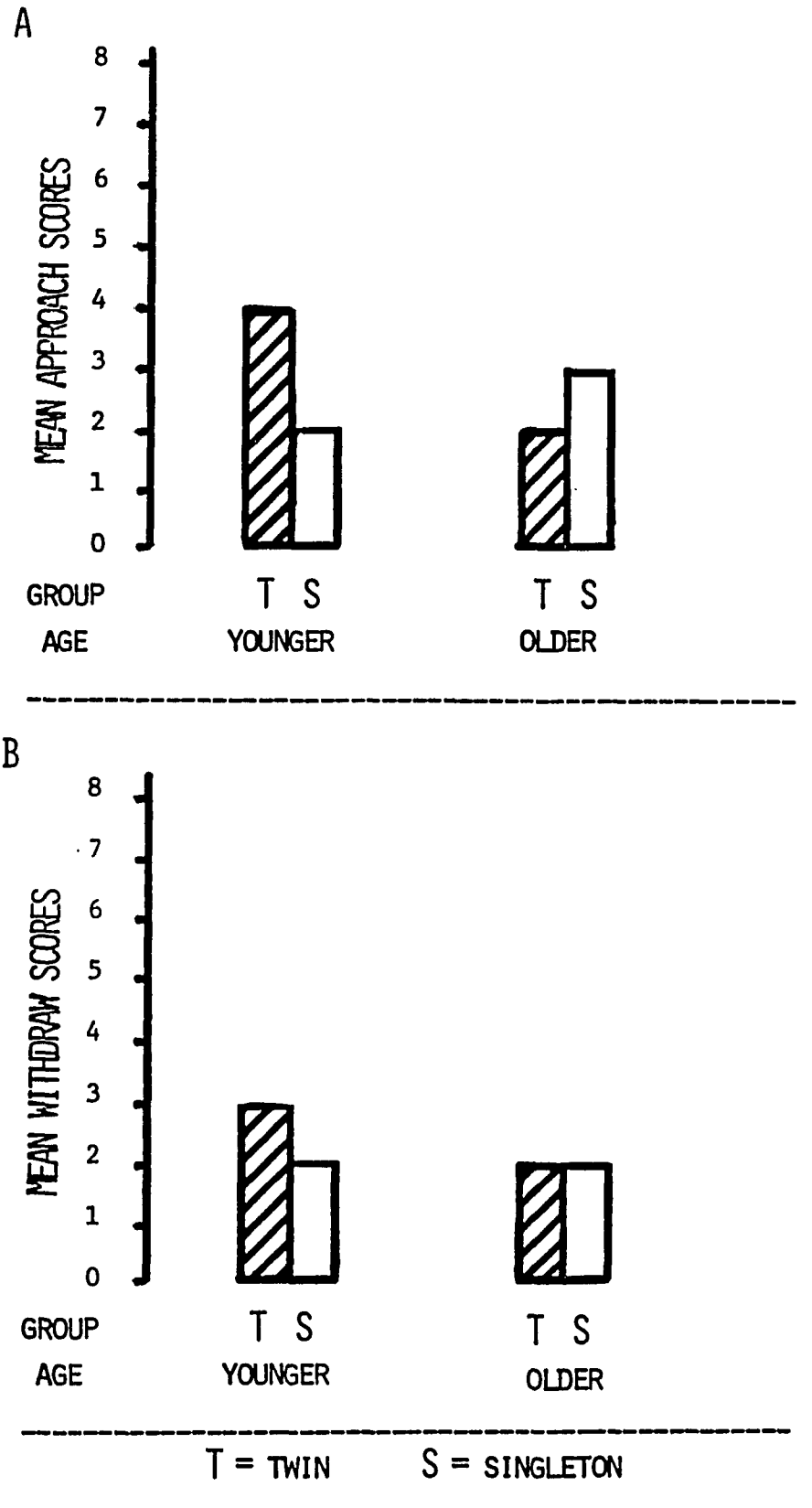

Figure 6A. Child-directed mean Approach scores.

Figure 6B. Child-directed mean Withdraw scores.

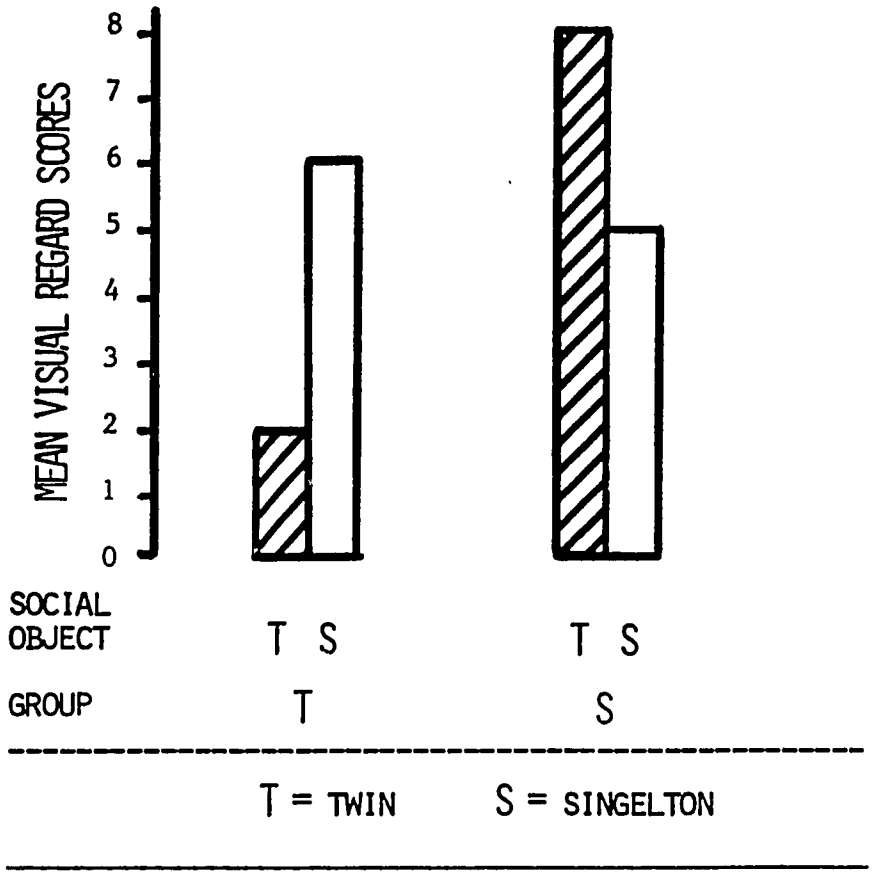

Figure 7. Child-directed mean Visual Regard scores.

In summary, analyses of categories which reflect initiating, terminating and maintaining social contact indicated several twin-singletons differences in both mother-directed and child-directed behavior. Although no group differences were found in children's initiation of mother-directed Approach and Withdraw, twins scored lower than singeltons in Proximity and Non-Specific Contact with their mothers at both age levels. Both twins' and singleton's scores in mother-directed Approach and Withdraw were higher at the younger age level than at the older age level, however, twins showed a larger decline in scores with age. Twin-singleton differences in child-directed behavior were as follows:

(1) Younger twins' scores for Proximity to their cotwin were higher than their scores for Proximity to singletons, however similar score differences at the older age level were not evident. Singletons' scores for Proximity to twins were higher than were their scores for Proximity to each other at both age levels, with some indication of larger score differences at the older age level. Both twins and singletons scored higher in Proximity at the older age level than at the younger age level, however twin-cotwin scores showed less difference with age than did singleton-twin scores. Twins scored higher in Proximity both as actors and as a class of social object;

(2) Twins also scored higher both as actors and a class of social object in the Non-Specific Contact category. In addition, twin-singleton score differences in Non-Specific Contact were higher at the younger age level than at the older age level.

(3) In contrast to Group main effects for Proximity and Non-Specific

Contact, Group main effects in Approach and Withdraw were not found. However, at both age levels, twins scored higher as social objects in Approach, and a similar trend was found for Withdraw scores. Also, regardless of social object, younger twins scored higher than older twins as initiators of Approach and Withdraw. Younger singletons scored lower than older singletons as initiators of Approach, and younger and older singletons showed similar levels of Withdraw scores.

(4) Finally, singletons scored higher in Visual Regard than did twins, with their highest scores in Visual Regard of twins. Twins' scores in Visual Regard of singletons were higher than their scores for Visual Regard of their cotwin, and singletons scores in Visual Regard of twins were higher than their scores in Visual Regard of each other.

2. Characteristics of social contact.

Object-centered interactions. With regard to mother-directed interactions, analysis of scores in the category of Offer Toy to mother indicated a significant trend for Age x Group effects ($p=.08$). Younger twins scored higher than younger singletons and older children in this category. No group differences in the category of Offer Toy to mother were found. Per-session mean scores in Accept Toy from mother were less than one and, therefore, were not analyzed. Mother-directed Take, Resist Take, and Parallel Manipulation of Toys rarely occurred.

Analyses of child-directed interactions indicated a significant Age x Group x Object effect in Parallel Manipulation of Toys ($p < .05$). No Group or Object main effects were obtained.

Figure 8 illustrates the mean scores for this category graphed in the same manner as results for Proximity scores previously described. These data show a similar pattern of results to those of Proximity. The graph illustrates that younger twins scored higher in Parallel Manipulation of Toys with their cotwin (T-T) than with singletons (T-S); however, at the older age level, there was little indication that twin-cotwin scores differed from twin-singleton scores. Singleton scores in Parallel Manipulation of Toys showed less difference between Social Objects by age level, with some indication of higher singleton-twin scores at the older age level (S-T versus S-S). Overall, both twins and singletons showed higher scores in Parallel Manipulation of Toys at the older age level as compared to the younger age level, with little indication of Group differences at the older age level. Twin-cotwin (T-T) scores showed less difference by age level than did singleton-twin scores (S-T).

Per-session mean scores for child-directed Offer, Accept, Take, Resist Take, and Show Toys were less than one; therefore, ANOVA procedures were not performed on these data. Inspection of the data indicated Take and Resist Take were the most frequently recorded of these categories. The great majority of recordings of these two categories were for only one pair of younger twins.

General affective quality of contacts. Per-session mean scores for Positive Contact and Negative Contact were less than one; therefore, ANOVA was not performed on these data. There were only 28 recordings of Positive Contact throughout the play sessions, and 27

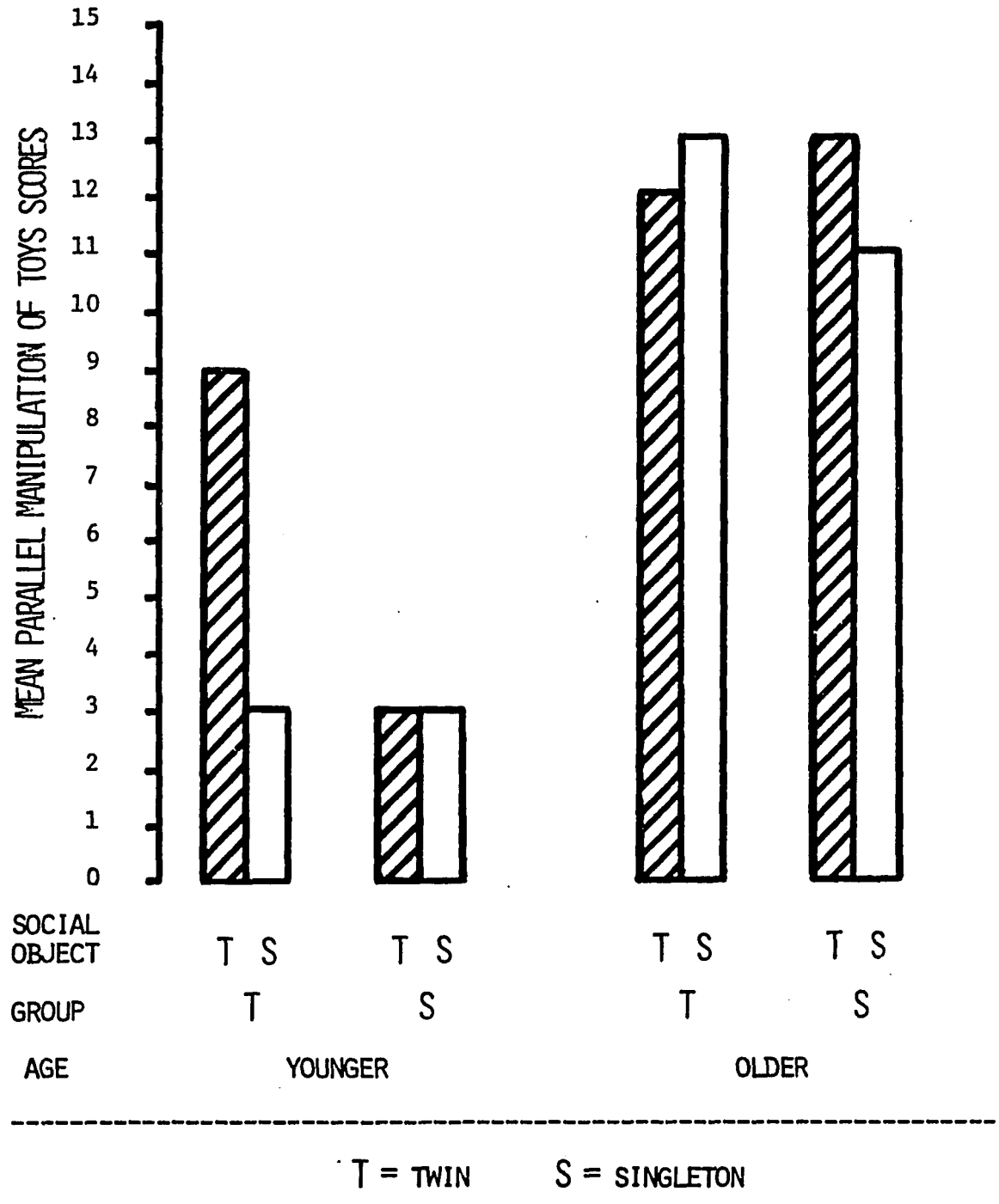

Figure 8. Child-directed mean Parallel Manipulation of Toys scores.

of these were mother-directed. Negative Contact was recorded at the same frequency, yet the great majority of Negative Contacts that occurred were for only one pair of younger twins, the same pair previously indicated to have shown a relatively higher incidence of Take and Resist Take of Toys. The greater incidence of Negative Contact for this one pair also seems to have accounted for a significant Age x Group trend in Frown/Cry scores ($p=.07$). Finally, twin-singleton score differences in Smile/Laugh were not found.

Communicative/expressive behavior. Results indicated that older children scored higher in Verbalize ($p < .05$) and younger children scored higher in Vocalize ($p < .05$), yet no group differences in these data were found. Non-verbal categories of Point and Gesture occurred too infrequently to be analyzed.

Imitative behavior. There was only one recording of imitative behavior throughout the play sessions. This was a younger twin's Imitative Vocalization of her cotwin.

In summary, few twin-singleton differences were obtained in analyses of categories reflecting general characteristics of children's social contacts. There was a low frequency of occurrence for several of the categories of behavior. Group differences in mother-directed interactions were found in only one category. Analyses of scores in Show Toy to mother showed a significant trend indicating younger twins scored higher than younger singletons and older children. Analyses of child-directed category scores indicated the following:

(1) Younger twins scored higher in Parallel Manipulation of Toys

with their cotwin than with singletons, yet there was little indication of a similar difference for older twins. Singletons' scores in Parallel Manipulation of Toys showed less difference between social objects by age level, with some indication of higher singleton- twin scores at the older age level. Both twins and singletons showed higher Parallel Manipulation of Toys scores at the older age level as compared to the younger age level, yet twin-cotwin scores showed less difference by age level in comparison to singleton-twin scores. There was less difference between groups at the older age level than at the younger age level.

(2) There was a trend for younger twins to score higher in Frown/Cry in comparison to younger singletons and older children. However, inspection of the data indicated this result was likely influenced by the behavior of only one pair of younger twins who accounted for most of the occurrences of Take and Resist Take of Toys and Negative Contact.

Self-directed behavior

No significant group differences were found for scores of Manipulate Self or Oral Contact with Self at either age level.

Object-directed behavior

Twins scored higher than singletons on Manipulate Toy ($p < .01$) at both age levels. Significant Group main effects for Oral Contact with Toy and Carry Toy were not found. The per-session mean scores for Throw Toy were less than one, therefore, these data were not analyzed.

Play posture and movement

Twins showed lower scores than singletons in the category of Stand ($p < .01$) and a significant trend for higher scores in Sit ($p = .08$) at both age levels. There were no Group main effects for Squat, Crawl, or Walk. Categories of Prone, Supine, and Run were recorded too infrequently to be analyzed.

Non-statistical comparisons of interest

In view of the previously described twin-singleton differences in both mother-directed and child-directed categories of Proximity and Approach, it is of interest to integrate these results in order to provide a more comprehensive viewpoint of the data from which to interpret the significant findings. This can be accomplished by graphing mother-directed and child-directed category score means on the same axis so that inspection of the patterning of scores across the three available social objects—mothers, twins , and singletons—can be made.

Figures 9A and 9B illustrate data for Proximity and Approach, respectively. In each figure, the score means for younger and older twins (T) and singletons (S) have been graphed by social object. Mother-directed score means (M) are represented by striped bars, and child-directed score means are represented by unstriped bars. The dashed bars represent the average for the two child social objects in each situation. The figures provide an integration of findings for Age x Group effects for mother-directed behavior and Age x Group x Object effects for child-directed behavior. Statistical comparisons of the data as graphed here have not been performed. The com-

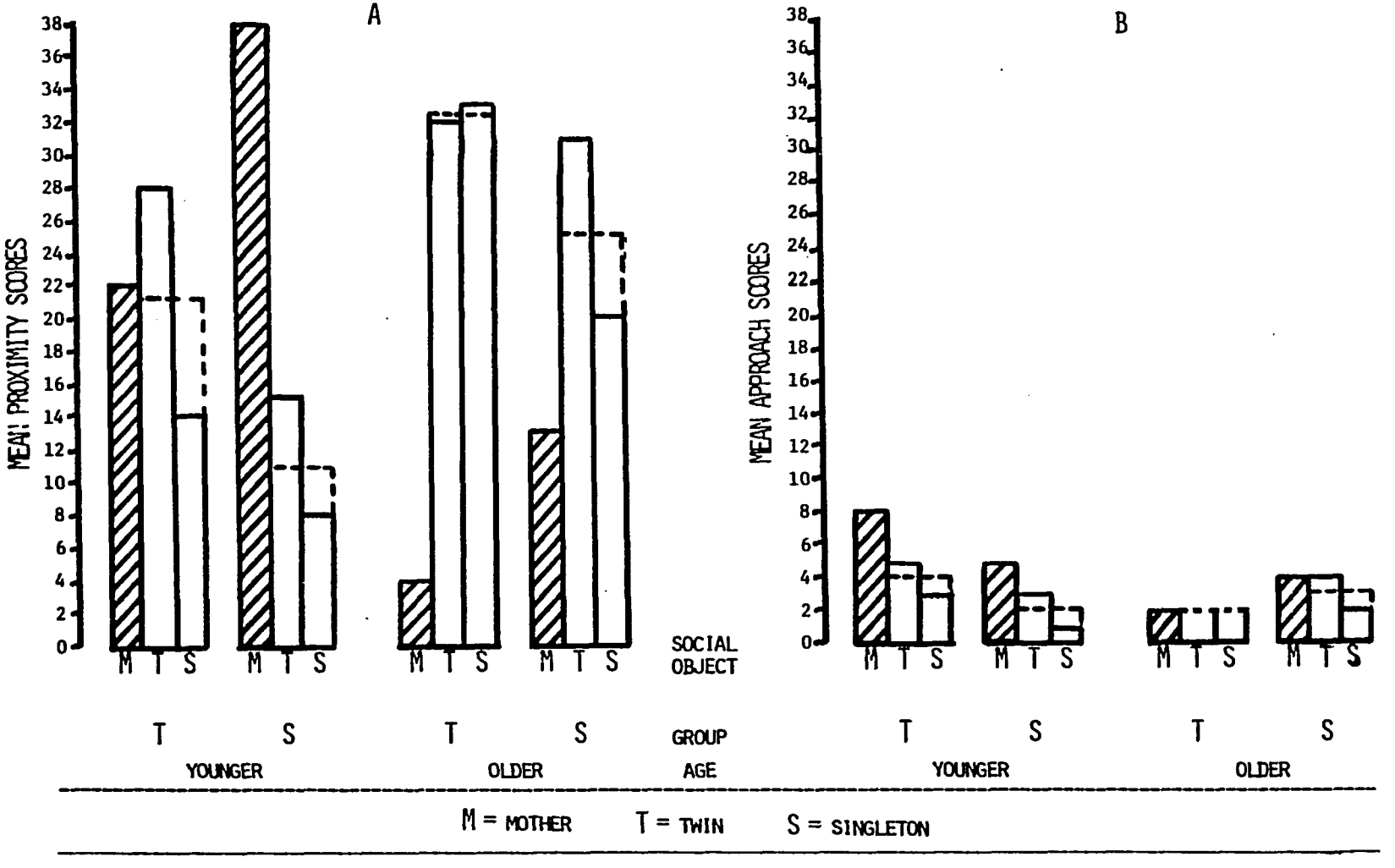

Figure 9A. Mean Proximity scores by social object for twins and singletons.

Figure 9B. Mean Approach scores by social object for twins and singletons.

bined results are presented primarily as an illustration of the between group and within-group patterning of scores by social object, and to illustrate the relationship between Proximity and Approach score patterns. In making comparisons, it should be kept in mind that mother-directed and child-directed scores and Proximity and Approach scores have different distributions.

Figure 9A presents Proximity score means. In comparing mothers (striped bars) versus child playmates (unstriped bars) as social object, it can be seen that younger children generally scored higher in Proximity to mother than in Proximity to child playmates, and older children generally scored higher in Proximity to child playmates than in Proximity to their mothers. The previously described group difference in Proximity to mother is shown by the striped bars. Twins scored lower in Proximity to their mothers than did singletons at both age levels. Futhermore, visual inspection indicates that at the younger age level twins showed a smaller difference between mother-directed and child-directed (dashed bars) Proximity scores in comparison to singletons, suggesting twins' Proximity score magnitudes were generally more similar than singletons acorss the available social objects (M-T-S). It also appears that younger twins scores for Proximity to their cotwin (T-T) were generally as high or higher than their scores in Proximity to their mother (T-M), and were similar in magnitude across age levels. The twin-singleton score differences show a different pattern at the older age level. In comparing mother versus child playmates as social object, it can be seen that older twins show a greater difference than do older singletons. The difference in the pattern of scores by age

level appears associated with twins greater decrease in Proximity to mother scores and higher scores for twins and singletons in Proximity to each other. In compairing twin-cotwin (T-T) with twin-mother (T-M) scores by age level, it appears that twin-cotwin scores show similar levels (or slightly increased) with age, as twin-mother scores decrease substantially.

Figure 9B shows mother-directed and child-directed Approach mean scores. In compairing mother versus child playmates as social object, it appears that both younger twins and singletons generally scored higher in Approach to mother, yet there is little difference in the magnitude of mother- versus child-directed scores at the older age level. The older-age-level pattern here contrasts with the score pattern for Proximity, which shows higher child-directed scores for older in comparison to younger children. Thus, it appears that older children often maintained Proximity to the child they approached. The graph also suggests that at the younger age level, twins and singletons showed similar differences in their mother-directed versus child-directed Approach scores (compare striped bars to dashed bars for each group). This small twin-singleton difference contrasts with large score differences for Proximity scores, suggesting twins received lower Proximity scores per each Approach to their mother.

Figure 9B also shows the previously described Age x Group effects for Approach (dashed bars for each group by age level). The graph shows the influence of the non-significant Age x Group x Object effects on the pattern of results obtained. From inspection of this graph,

it appears that in comparison to older twins, younger twins generally showed higher Approach scores to both their cotwin (T-T) and the singletons (T-S); however, there was a greater decrease in the twin-cotwin scores by age level. Older twins show very similar Approach score magnitudes across social objects (M-T-S). With regard to singletons, both younger and older singletons show higher Approach scores for twins as social object, and older singletons show higher scores than younger singletons (S-T versus S-S). Thus, it appears that the Age x Group interaction for Approach is associated with higher twin-cotwin scores at the younger versus older age level, and higher singleton-twin scores at the older versus younger age level. The graph also shows that younger twin-singleton (T-S) Approach scores were generally similar to younger singleton-twin (S-T) scores, and older twin-singleton (T-S) scores were generally similar to singleton-singleton (S-S) scores. It should be kept in mind that the score differences represented here are small and non-significant for the overall interaction.

Discussion

Analyses of observational data indicated that twins and singletons differed in the patterning and characteristics of their social behavior in a playgroup situation with their mothers present. Twin-singleton differences were found in both mother-directed and child-directed social contacts. These differences were most evident in comparing the behavior of the children at the younger versus older age level studied (approximately two years and three years of age, respectively).

Observations of mother-directed behavior indicated twins maintained proximity and contact with their mothers substantially less than did singleton children, despite similar rates of approaches to, and withdrawals from their mothers during the play sessions. Both twins and singletons decreased approaches to and withdrawals from their mothers with age, yet twins showed a greater decrease with age than did singletons. In comparing mother-directed versus child-directed behavior, it was noted that twins tended to maintain proximity to their cotwins as often or more often than they maintained proximity to their mothers. In addition, compared to younger singletons, younger twins tended to show less difference in maintaining proximity to their mother versus their child playmates.

The observed group differences in mother-directed behavior suggest that twins were more secure in the playgroup situation than were singleton children and, therefore, spent less time near to and in physical contact with their mothers. It has been observed that young children show increased proximity— and contact-maintaining

behavior in novel situations in reaction to their uncertainty or wariness, and that this tendency decreases with age. In the play group setting of the present study, which included unfamiliar peers, adults, and objects, both twins and singletons tended to approach and maintain proximity to their mothers more frequently at the younger age level than at the older age level. However, twins showed a greater decrease in this tendency than did singletons and also maintained proximity to their mother less than singletons at both age levels. This pattern of behavior suggests twins were more secure. The finding that twins maintained proximity with their cotwin as often or more often as with their mother suggests that cotwins played an important role in modulating twins' mother-directed behavior. Twins may have provided each other with a secondary "secure base" (e.g., Ainsworth, 1969) from which to function socially within the novel play group situation, particularly at the younger age level.

The notion that twins afford each other security away from their mothers is consistent with Samuels' (1980) findings of similar effects pre-school age, non-twin children have on their infant siblings. Samuels found that two-year-old infants showed increased exploratory play away from their mothers in an unfamiliar setting (backyard of a private home) when in the presence of their older siblings. Infants left their mothers more readily, stayed away longer, and engaged in more object manipulation at locations remote from their mothers when an older sibling was present than when the sibling was absent. In a similar manner, twins may increase each others' exploration and play in novel situations and reduce their need to maintain contact with

their mothers. Moreover, since twins' developmental levels are likely to be more similar than sibling pairs spaced in age, twins may be more inclined to engage in the same play activity together for a longer period of time than in the case for other sibships.

Although twins were in proximity to their mothers less often than were singleton children, there was no evidance to suggest they also interacted less with their mothers. Twins and singletons showed similar rates of mother-directed Approach, Visual Regard, or Offer of Toys. In addition, younger twins showed a tendency to Show Toys to their mothers more than did younger singletons. Therefore, it appears that the twin-singleton differences in mother-directed proximity and contact were associated more with differences in relative security rather than a tendency for twins to interact with their mothers less often than the singleton children. Thus, these results do not support the notion of Lytton et al. (1977) and others that twins exhibit more attachment behavior toward their mothers, yet interact with their mothers less than singleborn children since they spend more time together away from their mothers. This was not observed in the present playgroup situation.

Results for child-directed social behavior indicated children increased in their social contacts and interaction with each other with age, which corresponded with decreases in mother-directed behavior. Twin-singleton differences were evident in comparing the pattern of behavior at the younger versus older age level. Observational data indicated younger twins played near their cotwins and manipulated the same toy with them more often than with single-

ton children. However, older twins played near singleton children and manipulated toys with them as often as with their cotwin. Both younger and older singleton children played near twins and manipulated toys with them more often than with each other. There was little indication of twin-singleton differences in object-centered interaction at the older age level.

The general pattern of these results indicate twins were involved in child-directed social contact and interaction more often than were singletons. This result was also reflected in data for categories of Approach and Withdraw. Twins were the most frequently approached children for social contact initiated by both their cotwins and singleton peers, and the data for withdrawal showed a similar trend. Twins were also visually regarded by singletons more than singletons visually regarded each other and more than twins visually regarded singletons. Despite these differences, twins and singletons initiated approaches at similar rates. Thus, it appears twins were often the 'center' of child social interaction in the playgroup situation. Since twins played near each other often at both age levels, the pattern of social contacts that was often observed was a 'clustering' around twins in which one or both of the singletons joined twins as they played with the same toy or played near twins with another toy.

A fuller understanding of twin-singleton differences in child-directed interaction was gained by viewing the overall pattern of social contacts made across the three available classes of social partners: mothers, twins, and singletons. Since twins and singletons differed significantly in their amounts of proximity-maintaining behavior

toward their mothers, it is likely they also differed in their availability for social contact with other children. Twins maintained proximity to their mothers less often than did singletons at both age levels and, therefore, were more available as partners for interaction between children. In addition, since twins often played near each other, it may be that they composed a consistent, 'pre-established' play dyad which singletons tended to join or play near in preference to forming a dyad with a singleton child (and possibly in preference to playing alone). It also must be taken into consideration that twins' similarity in appearance may have made them more attractive social partners than were singletons to each other. This notion receives some support from the pattern of results for Visual Regard.

It can be inferred from these findings that twins did not isolate themselves from social interaction with other children. Proximity-maintaining behavior involves the mutual participation of social partners; therefore, since twins did not differ significantly from singletons in their rates of child-directed withdrawals, it can be assumed that they were receptive to singletons' social approaches and interaction with them. In addition, twins showed rates of social approach which were similar to singletons at both age levels. Thus, these results do not support the position that twinship significantly reduces the amount of twins' interaction with their peers (e.g., Kim, et al., 1969). Despite the finding that twins do play near each other often in a playgroup situation, it appears they remain receptive to interaction with other playmates, even at the two-year-old age level.

Although twins and singletons made social contacts and manipulated

toys together often, there was a low incidence of more direct forms of interaction, such as toy interchanges (e.g., Offer Toy, Show Toy) for both groups. A low incidence of toy-centered interaction is not an uncommon finding in laboratory studies of young children's social behavior. Higher levels of interaction have been observed in more familiar settings or after children have had the opportunity to become more acquainted with each other through repeated exposure (e.g., Cohen & Tomlinson-Keasy, 1980; Doyle, Connolly, & Rivest, 1980). Apparently, the two play sessions employed in this study were not enough for children to become sufficiently familiar for more direct forms of interactive behavior to develop; therefore, interaction was limited to the more global aspect of Parallel Manipulation of Toys. Due to the low incidence of other forms of interactive behavior which distinguish the initiator and reciprocator of the toy-centered interchanges, these data do not provide a basis for making inferences about the finer characteristics of twins' and singletons' age-mate interactions.

In conclusion, results of this study indicate that young twins and singletons differ in their mother-directed and child-directed social behavior. The differences observed suggested that twinship affords twins security away from their mothers in a novel play setting. In addition, since twins do play near each other often, they may attract other children to play with or near them, perhaps because they provide a pre-established play dyad or appear to be special types of children.

Observations of twin social behavior in this study do not support the notion that twinship increases attachment behavior, or decreases mother-child and peer interaction, as has been suggested by the observations of other investigators (e.g., Burlingham, 1952; Lytton et al., 1977; Kim et al., 1969). On the contrary, in a playgroup setting, which in some ways simulates naturalistic situations, twins interacted with peers fairly frequently and also directed less attachment-like behavior toward their mothers than did singletons. Perhaps the most important contribution of these findings,then, is to provide a more favorable view of the social consequences of twinship. Previous studies and popular speculation have generally emphasized the negative social consequences which result from twinship. The data presented here, in conjunction with those of Koch (1966), suggest there is little cause for alarm. Although twinship influences in early social behavior are evident, the twin-singleton differences observed here were no more striking than that expected for other sibships in which pair members are close in age.

Results of the present investigation suggest several directions for future studies of the social behavior of twins. First, the role of twinship in the maternal attachment process merits closer analysis. It could be particularly informative to conduct a detailed study of twins' early relationship with each other to determine if it constitutes a secondary attachment relationship and to determine how it relates to twins' primary attachment to their mothers. Deets (1974a) has suggested that twin-siblings may play an important role in twins' attachment relationship with their mothers.

It has been previously observed that infants form attachment-like relationships with older siblings (e.g., Ainsworth, 1967; Schaeffer & Emmerson, 1964); however, the concept of sibling attachment and its relevance to maternal attachment has apparently received only preliminary study (e.g., Tiegel, 1973). Since twins are together from birth, it is reasonable to assume they are a salient attachment object for each other from an early age. Their attachment to each other may be characteristically different from similar secondary attachments formed between non-twin sibling pairs whose age-interval is generally a year or more.

Use of Ainsworth's "strange situation" (e.g., Ainsworth, 1970) and other methodologies could provide a direct examination of twins' attachment behavior. For example, it would be of interest to study twins' social behavior in novel settings both with and without their cotwins and both with and without their mothers in comparison to singleton-sibling pairs under similar conditions. If twinship affords twins additional security in the absence of their mothers, it may have implications for their social behavior in naturalistic settings, such as nursery school, where they have contact with other younger children.

It will also be important to consider the maternal side of twins' mother-child relationship; that is, the changes twin siblings bring about in the child-directed behavior of their mothers. This is an equally significant component of the maternal attachment and socialization process in light of the bidirectional basis of social development (e.g., Cairns, 1979). This variable was not considered in the present study. Child-directed behavior of the mothers of twin and

singleton subjects was kept relatively constant by instructing mothers not to intervene in their children's play. Nevertheless, previous studies suggest that the maternal behavior of mothers of twins may be responsible for twin-singleton differences in early social behavior (e.g., Lytton, et al., 1977; Paluszny and Gibson, 1974; Deets, 1974a). An understanding of the interactional effects of maternal and twin-sibling variables awaits further study.

Twins' peer relations also warrant further investigation. It would be of interest to determine if the play 'clustering' around twins observed in this study occurs in other settings. Play clustering has been observed previously in laboratory studies of play groups composed of infant singleton peers. Mueller and Rich (1976) have analyzed the frequency with which three or more of five members of a playgroup come together over a single object or activity. They found a high frequency of clustering from the children's first play session together. Also, the frequency and complexity of the social behavior within the cluster increased over sessions. Since twins often play together for long periods of time and may appear as special types of children, they may often form the 'core' of such clusters of peers in naturalistic settings. This may have the advantage of increased peer activity which could influence their early social behavior.

Finally, it will be important to study other types of twin pairs and to compare twins' social behavior to other types of singleton controls, in order to generalize the findings of this study. Twin pairs vary according to the gender and zygosity of the pair members. There are five different types of twins; namely, identical same-sex

females and males, fraternal same-sex females and males, and fraternal opposite-sex twins. The subject sample of the present study included only same-sex female twin's and was mixed in terms of zygosity. This must be kept in mind in making generalizations from the results obtained, since sex differences in early social behavior have been observed (e.g., Ambrovitch, Corter, & Pepler, 1980; Brooks-Gunn & Lewis, 1979; Jacklin and Maccoby, 1978).

Comparisons of twins' social behavior with the social behavior of other sibships is also an important next step for research. Of particular interest are comparisons between twins, singleborn-sibling pairs close in age, and singleborn-sibling pairs widely spaced in age. Twinship represents somewhat of a baseline in these comparisons. Further research using these subgroups could contribute substantially to an understanding of the role of sibships in social development. Twins afford the unique opportunity for analyzing the effect of various sibship constellation variables (e.g., sex, ordinal position, and age-spacing of siblings) on social behavior, since twins' age-interval is virtually zero and their ordinal positions identical.

References

Ainsworth, M. D. S., Blehar, M. D., Waters, E., & Wall, S. The strange situation: Observing patterns of attachment. Hillsdale, N.J.; Erlbaum, 1978.

Ainsworth, M. D. S., & Witting, B. A. Attachment and exploratory behavior of one year olds in a strange situation. In B. M. Foss (Ed.), Determinants of infant behavior. vol. 4, London; Methuen, 1969.

Ambramovitch, R., Corter, C., & Lando, B. Sibling interaction in the home. Child Development, 1979, 50, 997-1003.

Ambramovitch, R., Corter, C., & Pepler, D. J. Observations of Mixed-Sex Sibling Dyads. Child Development, 1980, 51, 1268-1271.

Brooks-Gunn, J. & Lewis, M. The effect of age and sex on infants play-room behavior. Journal of Genetic Psychology, 1979, 134, 99-105.

Bronson, W. C. Developments in behavior with age-mates during the second year of life. In M. Lewis & L. A. Rosenblum (Eds.) Friendship and peer relations. New York: Wiley, 1975.

Burlingham, D. T. Twin's: A study of three pairs of identical twins. New York: International Universities Press, 1952.

Burlingham, D. T. A study of identical twins. Psychoanalytic Study of the Child, 1963, 18, 367-423.

Cairns, R. B. Social Development: The origins and plasticity of interchanges. San Francisco: W. H. Freeman & Co., 1979.

Cohen, N. L. & Tomlinson-Keasey, C. The effects of peers and mothers on toddler's play. Child Development, 1980, 51, 921-924.

Deets, A. C. Age-mate or twin sibling: Effects on interactions between monkey mothers and infants. Developmental Psychology, 1974a, 10 748-763.

Deets, A. C. Age-mate or twin sibling: Effects on monkey age-mate interactions during infancy. Developmental Psychology, 1974b, 10, 913-928.

Doyle, A., Connolly, J., & Privest, L. The effect of playmate familiarity on social interactions of young children. Child Development, 1980 51, 217-223.

Dunn, J. & Kendrick, C. Interaction between young siblings in the context of family relationships. In M. Lewis & L. A. Rosenblum. The child and its family. New York: Plenum Press, 1979.

Gottfried, N. W. & Seay, B. An observational tecnhique for preschool children. Journal of Genetic Psychology, 1973, 122, 263-268.

Gottfried, N. W. & Seay, B. Early social behavior: Age and sex baseline data from a hidden population. Journal of Genetic Psychology, 1974, 125, 61-69.

Jacklin, C. N. & Maccoby, E. E. Social behavior at 33 months in same-sex and mixed-sex dyads. Child Development, 1978, 49, 557-569.

Kallman, F. J. Heredity in health and mental disorder. New York: W. W. Norton & Company, 1953.

Kim, C. C., Dales, R. J., Conner, R., Walters, J., & Witherspoon, R. Social interaction of like-sex twins and singletons in relation to intelligence, language, & physical development. Journal of Genetic Psychology, 1969, 114, 203-214.

Koch, H. L. Twins and twin relations. Chicago: University of Chicago Press, 1966.

Lamb, M. E. Interactions between Eighteen-Month-Olds and their Preschool-Aged Siblings. Child Development, 1978a, 49, 51-59.

Lamb, M. E. The development of sibling relationships in infancy: A short-term longitudinal study. Child Development, 1978b, 49, 1189-1196.

Langlois, J. H., Gottfried, N. W., & Seay, B. The influence of sex of peer on social behavior of preschool children. Developmental Psychology, 1973, 8, 93-98.

Lee, L. C. Toward a cognitive theory of interpersonal development: Importance of peers. In M. Lewis & L. A. Rosenblum (Eds.), Friendship and peer relations. New York: Wiley, 1975.

Lewis, M. & Rosenblum, L. A. Friendship and Peer Relations. New York: Wiley, 1975.

Loehlin, J. C. & Nichols, R. C. Heredity, environment, and personality: A study of 850 sets of twins. Austin: University of Texas Press, 1976.

Luria, A. R. and Yudovich, F.I. Speech and the Development of Mental Processes in the Child. London: Staples Press, 1959.

Lytton, H., Conway, D., & Sauve', R. The impact of twinship on parent-child interaction. Journal of Personality and Social Psychology, 1977, 35, 97-107.

Mittler, P. Biological and social aspects of language development in twins. Developmental Medicine & Child Neurology, 1970, 12, 741-757.

Mueller, E. & Brenner, J. The growth of social interaction in toddler playgroups: The role of peer experience. Child Development, 1977, 35, 97-107.

Mueller, E. & Rich, A. Clustering and socially-directed behaviors in a toddlers playgroup. Journal of Child Psychology & Psychiatry, 1976, 17, 315-322.

Mueller, E. & Vandell, R. Infant-infant interaction; an empirical and conceptual review. In J. D. Osofsky (Ed.) Handbook of Infant Development. New York: Wiley, 1979.

Nance, W. E., Allen, G., & Parisi, P. (Eds.) Twin research; proceedings of the second interanational congress on twin studies (Part A), Psychology & Methodology, New York: Alan R. Liss, Inc., 1978.

Plauszny, M. & Gibson, R. Twin interactions in a normal nursery school. American Journal of Psychiatry, 1974, 131, 293-296.

Samuels, H. R. The effect of an older sibling in infant locomotor exploration of a new enviornment. Child Development, 1980, 51, 607-609.

Schaeffer, H. R. & Emerson, P. E. The development of social attachments in infancy. Monograph of the society for research in child development, 1964, 29, (3, Serial No. 94).

Tiegel, I. M. A validation study of sibling attachments. Dissertation Abstracts International, 1973.

Wagner, M. E., Schubert, H. J. P., & Schubert, D. S. P. Sibship-constellation effects on psychosocial development, creativity, and health. Advances in Child Development and Behavior, 1979, 14, 57-148.

White, B. Critical influences in the origins of competence. Merrill-Palmer Quarterly, 1975, 21, 243-266.

Zazzo, R. Genesis and peculiarities of the personalities of twins. In W. E. Nance, G. Allen, and P. Parisi (Eds.) Twin research; proceedings of the second international congress on twin studies. (Part A), Psychology & Methodology. New York: Alan R. Liss, Inc. 1978.

APPENDICES

Appendix A

Subject characteristics for each playgroup

Subject[1]	Age in Months	Twins Zygosity[2]	Other Siblings[3] Sex / Age	Time (in hours) Spent[4] With Mother	Sibling	Peers
T1	17	Dz	F, 6 yrs.	10	13	0
T2						
S1	19		M, 4½ yrs.	4	5	6
S2	19			8	0	6
T3	21	?	F, 3½ yrs.	10	13	1
T4						
S3	23		.	.	.	.
S4	23		.	.	.	.
T5	24	Mz	M, 5 yrs.	.	.	.
T6						
S5	24			12	0	2
S6	24			24	0	0
T7	31	Mz		12	12	0
T8						
S7	28			24	0	2
S8	34		M, 3 mos.	12	12	3
T9	34	Dz	M, 5 yrs.	14	14	0
T10						
S9	34		M, 5 yrs.	.	.	.
S10	34			.	.	.

Appendix A (cont.)

Subject[1]	Age in Months	Twins Zygosity[2]	Other Siblings Sex / Age[3]	Time (in hours) Spent[4] with Mother	Sibling	Peers
T11	36	Dz	M, 11 yrs.	12	12	2
T12						
S11	38		F, 1½ yrs.	10	8	6
S12	39		F, 6 yrs. M, 4½ yrs.	.	.	.
T13	40	?		.	.	.
T14						
S13	40		F, 6 mos.	14	14	1
S14	40		M, 1 yr.			
T15	43	Mz	F, 5½ yrs.	9	12	0
T16						
S15	42		M, 15 mos.			
S16	43		M, 6 mos.			

1 T1-T16 refer to Twins 1 through 16.
S1-S16 refer to Singletons 1 through 16.

2 Dz = Dizygotic (fraternal); Mz = Monozygotic (identical) as declared by twins mothers.

3 F = Female silbing, M = Male sibling.

4 Average number of hours spent weekly with each person as declared by mothers. Sibling category for twins represents time spent with each other.

Missing data indicated by "."

Appendix B

Behavior Category Observation System
Twin Project Revision

Socially-Directed Behavior

Category	Symbol	Definition
Approach	→	child moves from beyond to within one foot of a person
Withdraw	⊣	child moves from within to beyond one foot of a person.
Proximity	P	any part of child's body is within 1 ft. of a person.
Smile/Laugh	◡	The cornor's of the child's mouth are turned upward and/or child vocalizes sound of joy or amusement.
Frown/Cry	◠	The cornor's of the child's mouth are turned downward and/or child vocalizes discontent; i.e., cry, whine, fret, fuss.
Vocalization	V	child makes any non-word vocalization, e.g., unintelligible words, babble, grunt, scream, noise, singing, humming.
Verbalization	W	child speaks clearly recognizable word(s) or sentence(s).
Imitative Vocalization	V"	child repeats the same sound shortly after another person.
Imitative Verbalization	W"	child repeats the same word(s) or sentence(s) shortly after another person.

Appendix B (cont.)

Category	Symbol	Definition
Visual Regard		child's head is clearly directed toward face or head of other person.
Demonstrate		child demonstrates or shows a certain task or action to another person.
Offer		child extends arm with a toy in hand in the direction of another person, regardless of proximity.
Accept		child extends hand in the direction of another person in order to receive an offered object.
Take		child seizes, steals, or attempts to grab a non-offered object from another person.
Resist Take		child attempts to keep a person from taking a non-offered toy that is in hand.
Point		child clearly extends index finger toward a person or object.
Gesture		child makes hand, arm, or head movements directed at a person as a means of communication; i.e., wave, head nod (yes) or shake (no), shoulder shrug (?), hand signals (e.g., beckon). Point not included.
Positive Contact		child hugs, kisses, embraces, holds hands, affectionately touches, leans, pats or grooms other person.
Negative Contact		child forcefully strikes, pushes, kicks or bites, pulls hair or scratches another person.
Non-Specific Contact		any part of childs body comes in contact (non-forceable) with another person.

Appendix B (cont.)

Object-Directed Behavior		
Category	Symbol	Definition
Manipulate Object		child handles toy in any manner; e.g., stock blocks, place beads in toy, examine toy.
Pat Object		child rhythmically pats toy or bangs toys together.
Oral Contact with Object		Child places object in contact with mouth.
Transport Object		child carries object from one place to another moving at least 1 ft.
Throw Object		child casts, hurls, or drops a held object any distance.
Parallel Manipulation of Toy		child manipulates the same toy as another person or acts together with another person to perform a common task; e.g., take turns building a tower.
Imitative Manipulation		child repeats manipulation of a toy shortly after watching another person has performed the same action.

Self-Directed Behavior		
Category	Symbol	Definition
Manipulate Self		child manipulates own body or clothing with hands, e.g., adjust clothes, rub face or eyes, groom self.
Oral Contact with Self		child places part of body in contact with mouth; e.g., suck finger or thumb, etc.

Appendix B (cont.)

Posture and Movement

Category	Symbol	Definition
Supine		child lies on back.
Prone		child lies on stomach.
Sit		child rests with buttocks on floor or seat.
Squat		child croches or rests or haunches.
Stand		child stands
Crawl		child moves on hands and knees a distance of 1 ft.
Walk		child walks a distance of one foot.
Run		child runs, hops, skips, jumps, dances.

Appendix C

ANOVA Summary Table

Approach (mother-directed)

Source	Df	SS	F
BLOCK	7	604.75	14.71***
AGE	(1)	351.56	59.84***
GROUP	1	1.56	0.03
BLOCK x GROUP	7	314.43	7.65***
AGE x GROUP	(1)	56.25	9.57***
SESSION	1	56.25	2.38
BLOCK x SESSION	7	165.25	3.50**
AGE x SESSION	(1)	60.06	8.90***
GROUP x SESSION	1	7.56	1.77
BLOCK x GROUP x SESSION	7	29.93	0.63
AGE x GROUP x SESSION	(1)	0.25	0.04
SUBJECT (BLOCK x GROUP)	16	94.00	
MODEL	47	1273.75	4.01***
ERROR	16	108.00	
TOTAL	63	1381.75	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Non-Specific Contact (mother-directed)

Source	Df	SS	F
BLOCK	7	2267.23	1.21
AGE	(1)	1378.27	5.16**
GROUP	1	1251.39	6.48**
BLOCK x GROUP	7	1352.23	0.72
AGE x GROUP	(1)	805.14	3.02*
SESSION	1	1.27	0.01
BLOCK x SESSION	7	1178.36	1.85
AGE x SESSION	(1)	415.14	4.55**
GROUP x SESSION	1	185.64	1.64
BLOCK x GROUP x SESSION	7	791.98	1.24
AGE x GROUP x SESSION	(1)	310.64	3.41*
SUBJECT (BLOCK x GROUP)	16	4272.25	
MODEL	47	11300.36	2.64**
ERROR	16	1458.25	
TOTAL	63	12758.61	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Offer Toy (mother-directed)

Source	Df	SS	F
BLOCK	7	159.61	2.41*
AGE	(1)	83.27	8.81***
GROUP	1	26.27	1.19
BLOCK x GROUP	7	154.61	2.34*
AGE x GROUP	(1)	6.89	0.73
SESSION	1	6.89	0.50
BLOCK x SESSION	7	96.48	1.68
AGE x SESSION	(1)	28.89	3.52*
GROUP x SESSION	1	6.89	1.51
BLOCK x GROUP x SESSION	7	31.98	0.56
AGE x GROUP x SESSION	(1)	0.02	0.00
SUBJECT (BLOCK x GROUP)	16	151.25	
MODEL	47	633.98	1.64
ERROR	16	131.25	
TOTAL	63	769.23	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Proximity (mother-directed)

Source	Df	SS	F
BLOCK	7	9735.61	2.61*
AGE	(1)	7503.89	14.09***
GROUP	1	2588.27	7.78**
BLOCK x GROUP	7	2329.86	0.62
AGE x GROUP	(1)	252.02	0.47
SESSION	1	102.51	0.98
BLOCK x SESSION	7	732.61	0.50
AGE x SESSION	(1)	87.89	0.42
GROUP x SESSION	1	656.64	5.27*
BLOCK x GROUP x SESSION	7	872.98	0.59
AGE x GROUP x SESSION	(1)	763.14	3.62*
SUBJECT (BLOCK x GROUP)	16	8520.75	
MODEL	47	25539.23	2.58**
ERROR	16	3371.75	
TOTAL	63	28910.98	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Show Toy (mother-directed)

Source	Df	SS	F
BLOCK	7	63.25	1.13
AGE	(1)	6.25	0.78
GROUP	1	14.06	1.66
BLOCK x GROUP	7	59.19	1.05
AGE x GROUP	(1)	27.56	3.48*
SESSION	1	14.06	1.47
BLOCK x SESSION	7	67.19	1.12
AGE x SESSION	(1)	5.06	0.59
GROUP x SESSION	1	20.25	2.12
BLOCK x GROUP x SESSION	7	67.00	1.11
AGE x GROUP x SESSION	(1)	4.00	0.47
SUBJECT (BLOCK x GROUP)	16	128.50	
MODEL	47	433.50	1.07
ERROR	16	137.50	
TOTAL	63	571.00	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Visual Regard (mother-directed)

Source	Df	SS	F
BLOCK	7	284.23	3.49**
AGE	(1)	43.89	3.77*
GROUP	1	178.89	3.50*
BLOCK x GROUP	7	358.23	4.40***
AGE x GROUP	(1)	5.64	0.48
SESSION	1	4.52	0.21
BLOCK x SESSION	7	147.61	2.61*
AGE x SESSION	(1)	17.02	1.74
GROUP x SESSION	1	0.39	0.02
BLOCK x GROUP x SESSION	7	133.73	1.96
AGE x GROUP x SESSION	(1)	2.64	0.27
SUBJECT (BLOCK x GROUP)	16	186.25	
MODEL	47	1293.86	2.82**
ERROR	16	156.25	
TOTAL	63	1450.11	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix C

ANOVA Summary Table

Withdraw (mother-directed)

Source	Df	SS	F
BLOCK	7	449.23	18.42***
AGE	(1)	268.14	76.96***
GROUP	1	0.02	0.00
BLOCK x GROUP	7	261.11	10.71***
AGE x GROUP	(1)	31.64	9.08***
SESSION	1	26.27	1.38
BLOCK x SESSION	7	133.36	3.43**
AGE x SESSION	(1)	54.39	9.81***
GROUP x SESSION	1	8.27	0.91
BLOCK x GROUP x SESSION	7	59.86	1.54
AGE x GROUP x SESSION	(1)	1.27	0.23
SUBJECT (BLOCK x GROUP)	16	55.75	
MODEL	47	993.86	3.81***
ERROR	16	88.75	
TOTAL	63	1082.61	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix D

Table of Means and Standard Deviations

Approach (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	5.88	3.98	5.13	3.60
Session 2	10.50	7.21	8.13	2.59

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.38	2.39	4.13	4.49
Session 2	1.88	1.96	3.50	2.00

Appendix D

Table of Means and Standard Deviations

Non-Specific Contact (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	3.25	2.43	27.00	29.01
Session 2	6.25	4.98	14.38	14.77

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	0.38	0.74	1.13	1.13
Session 2	4.75	4.95	7.50	9.21

Appendix D

Table of Means and Standard Deviations

Show Toy (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.13	2.90	3.38	4.50
Session 2	4.75	3.20	4.75	3.20

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	0.50	1.07	3.13	5.36
Session 2	0.50	1.07	1.75	2.55

Appendix D

Table of Means and Standard Deviations

Proximity (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	14.75	14.07	44.75	34.33
Session 2	28.25	11.84	31.63	20.02

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.63	3.02	9.88	13.80
Session 2	6.00	5.98	15.25	16.42

Appendix D

Table of Means and Standard Deviations

Visual Regard (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	3.00	2.39	5.50	6.99
Session 2	3.25	1.39	6.25	7.44

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.38	1.51	5.88	5.94
Session 2	0.38	0.52	3.75	4.62

Appendix D

Table of Means and Standard Deviations

Withdraw (mother-directed)

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.75	3.45	4.38	3.02
Session 2	8.88	6.15	6.50	2.83

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.38	2.72	3.25	4.17
Session 2	1.25	1.28	2.25	2.38

Appendix E

ANOVA Summary Table

Approach (child-directed)

Source	Df	SS	F
BLOCK	7	150.75	2.90**
AGE	(1)	24.50	3.29*
GROUP	1	6.13	0.34
BLOCK x GROUP	7	126.63	2.43*
AGE x GROUP	(1)	40.50	5.45**
OBJECT	1	55.13	7.90**
BLOCK x OBJECT	7	48.88	1.52
AGE x OBJECT	(1)	8.00	1.74
GROUP x OBJECT	1	8.00	1.30
BLOCK x GROUP x OBJECT	7	43.00	1.33
AGE x GROUP x OBJECT	(1)	8.00	1.74
SESSION	1	2.00	0.26
BLOCK x SESSION	7	54.50	1.69
AGE x SESSION	(1)	2.00	0.43
GROUP x SESSION	1	12.50	0.75
BLOCK x GROUP x SESSION	7	116.50	3.60***
AGE x GROUP x SESSION	(1)	0.13	0.03
OBJECT x SESSION	7	0.13	0.03
BLOCK x OBJECT x SESSION	7	28.63	0.89
AGE x OBJECT x SESSION	(1)	0.00	0.00
GROUP x OBJECT x SESSION	1	21.13	3.55*
BLOCK x GROUP x OBJECT x SESSION	7	41.63	1.29
SUBJECT (BLOCK x GROUP)	16	119.00	
MODEL	79	834.50	2.29***
ERROR	48	221.00	
TOTAL	127	1055.50	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix E

ANOVA Summary Table

Non-Specific Contact (child-directed)

Source	Df	SS	F
BLOCK	7	717.09	8.73***
AGE	(1)	325.13	27.71***
GROUP	1	190.13	9.63**
BLOCK x GROUP	7	138.25	1.68
AGE x GROUP	(1)	69.03	5.88**
OBJECT	1	180.50	12.53***
BLOCK x OBJECT	7	100.88	0.79
AGE x OBJECT	(1)	16.53	0.91
GROUP x OBJECT	1	75.03	2.71
BLOCK x GROUP x OBJECT	7	241.84	1.90*
AGE x GROUP x OBJECT	(1)	15.13	0.83
SESSION	1	34.03	1.85
BLOCK x SESSION	7	128.59	1.01
AGE x SESSION	(1)	40.50	2.23
GROUP x SESSION	1	3.13	0.11
BLOCK x GROUP x SESSION	7	202.00	1.59
AGE x GROUP x SESSION	(1)	26.28	1.45
OBJECT x SESSION	7	0.50	0.02
BLOCK x OBJECT x SESSION	7	191.13	1.50
AGE x OBJECT x SESSION	(1)	42.87	2.36
GROUP x OBJECT x SESSION	1	5.28	0.29
BLOCK x GROUP x OBJECT x SESSION	7	636.34	5.01***
SUBJECT (BLOCK x GROUP)	16	187.75	0.65
MODEL	79	3032.47	2.11***
ERROR	48	871.25	
TOTAL	127	3903.72	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix E

ANOVA Summary Table

Parallel Manipulation of Toys (child-directed)

Source	Df	SS	F
BLOCK	7	4220.75	22.65***
AGE	(1)	1937.53	72.77***
GROUP	1	81.28	1.32
BLOCK x GROUP	7	432.47	2.32*
AGE x GROUP	(1)	46.13	1.69
OBJECT	1	91.13	2.09
BLOCK x OBJECT	7	305.88	1.69
AGE x OBJECT	(1)	38.28	1.48
GROUP x OBJECT	1	34.03	0.11
BLOCK x GROUP x OBJECT	7	2111.98	11.65***
AGE x GROUP x OBJECT	(1)	153.13	5.91**
SESSION	1	157.53	7.07**
BLOCK x SESSION	7	155.97	0.86
AGE x SESSION	(1)	10.13	0.39
GROUP x SESSION	1	28.13	0.57
BLOCK x GROUP x SESSION	7	346.88	1.91*
AGE x GROUP x SESSION	(1)	0.03	0.00
OBJECT x SESSION	7	34.03	1.85
BLOCK x OBJECT x SESSION	7	128.72	0.11
AGE x OBJECT x SESSION	(1)	10.13	0.39
GROUP x OBJECT x SESSION	1	4.50	0.17
BLOCK x GROUP x OBJECT x SESSION	7	827.75	4.57***
SUBJECT (BLOCK x GROUP)	16	426.00	
MODEL	79	9387.00	4.59***
ERROR	48	1243.00	
TOTAL	127	10630.00	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix E

ANOVA Summary Table

Proximity (child-directed)

Source	Df	SS	F
BLOCK	7	7417.75	7.73***
AGE	(1)	5227.53	38.15***
GROUP	1	2112.50	9.12**
BLOCK x GROUP	7	1621.13	1.69
AGE x GROUP	(1)	69.03	0.50
OBJECT	1	2064.03	37.16***
BLOCK x OBJECT	7	388.84	0.51
AGE x OBJECT	(1)	105.13	0.96
GROUP x OBJECT	1	16.53	0.02
BLOCK x GROUP x OBJECT	7	4664.59	6.09***
AGE x GROUP x OBJECT	(1)	578.00	5.28**
SESSION	1	66.13	0.47
BLOCK x SESSION	7	991.25	1.29
AGE x SESSION	(1)	413.28	3.78*
GROUP x SESSION	1	10.13	0.06
BLOCK x GROUP x SESSION	7	1231.50	1.61
AGE x GROUP x SESSION	(1)	38.28	0.35
OBJECT x SESSION	7	413.28	2.02
BLOCK x OBJECT x SESSION	7	1430.59	1.87*
AGE x OBJECT x SESSION	(1)	120.13	1.10
GROUP x OBJECT x SESSION	1	57.78	0.14
BLOCK x GROUP x OBJECT x SESSION	7	2973.84	3.88***
SUBJECT (BLOCK x GROUP)	16	2192.50	
MODEL	79	27652.38	3.20***
ERROR	48	5252.50	
TOTAL	127	32904.88	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix E

ANOVA Summary Table

Withdraw (child-directed)

Source	Df	SS	F
BLOCK	7	103.99	6.00***
AGE	(1)	27.19	10.98***
GROUP	1	11.88	0.86
BLOCK x GROUP	7	97.18	5.61***
AGE x GROUP	(1)	17.28	6.97**
OBJECT	1	21.95	4.54*
BLOCK x OBJECT	7	33.87	1.75
AGE x OBJECT	(1)	2.26	0.82
GROUP x OBJECT	1	0.01	0.00
BLOCK x GROUP x OBJECT	7	51.30	2.65**
AGE x GROUP x OBJECT	(1)	3.44	1.24
SESSION	1	2.82	0.69
BLOCK x SESSION	7	28.49	1.47
AGE x SESSION	(1)	0.20	0.07
GROUP x SESSION	1	11.88	1.05
BLOCK x GROUP x SESSION	7	78.93	4.07**
AGE x GROUP x SESSION	(1)	1.76	0.63
OBJECT x SESSION	7	0.63	0.19
BLOCK x OBJECT x SESSION	7	22.93	1.18
AGE x OBJECT x SESSION	(1)	0.95	0.34
GROUP x OBJECT x SESSION	1	9.57	4.47*
BLOCK x GROUP x OBJECT x SESSION	7	14.99	0.77
SUBJECT (BLOCK x GROUP)	16	39.63	
MODEL	79	530.05	2.42***
ERROR	48	132.88	
TOTAL	127	662.93	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix E

ANOVA Summary Table

Visual Regard (child-directed)

Source	Df	SS	F
BLOCK	7	230.38	0.83
AGE	(1)	69.03	1.74
GROUP	1	300.13	11.21**
BLOCK x GROUP	7	187.38	0.67
AGE x GROUP	(1)	101.53	2.56
OBJECT	1	2.00	0.03
BLOCK x OBJECT	7	508.00	3.19***
AGE x OBJECT	(1)	3.78	0.17
GROUP x OBJECT	1	450.00	8.13**
BLOCK x GROUP x OBJECT	7	387.50	2.43**
AGE x GROUP x OBJECT	(1)	16.53	0.73
SESSION	1	36.13	1.07
BLOCK x SESSION	7	236.13	1.48
AGE x SESSION	(1)	94.53	4.15**
GROUP x SESSION	1	0.13	0.01
BLOCK x GROUP x SESSION	7	172.13	1.08
AGE x GROUP x SESSION	(1)	13.78	0.60
OBJECT x SESSION	7	32.00	2.88
BLOCK x OBJECT x SESSION	7	77.75	0.49
AGE x OBJECT x SESSION	(1)	42.78	1.88
GROUP x OBJECT x SESSION	1	0.50	0.07
BLOCK x GROUP x OBJECT x SESSION	7	48.75	0.31
SUBJECT (BLOCK x GROUP)	16	634.50	
MODEL	79	3303.38	1.84
ERROR	48	1093.50	
TOTAL	127	4396.88	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix F

Table of Means and Standard Deviations

Approach (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.63	3.58	3.88	3.64	3.50	3.21	0.50	0.93
Session 2	5.00	2.88	2.13	1.89	3.00	3.93	2.38	2.45

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.13	1.64	2.75	2.31	3.75	4.53	1.38	1.19
Session 2	1.50	1.41	1.25	0.89	3.25	3.69	2.00	2.56

Appendix F

Table of Means and Standard Deviations

Non-Specific Contact (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	5.38	3.89	4.75	5.18	0.63	1.06	0.50	0.76
Session 2	8.13	5.06	1.00	1.41	0.63	0.74	1.87	2.17

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	10.88	7.14	3.13	2.10	7.50	4.14	7.00	7.89
Session 2	6.13	7.04	6.00	5.81	5.88	9.10	1.88	2.90

Appendix F

Table of Means and Standard Deviations

Parallel Manipulation of Toys (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	9.75	5.90	4.13	5.59	4.75	9.60	1.63	2.77
Session 2	7.50	6.50	1.13	1.37	0.50	0.76	4.50	8.07

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	15.38	9.80	12.75	5.92	12.50	4.63	13.00	16.82
Session 2	8.50	7.11	12.25	6.30	12.88	11.34	8.88	13.73

Appendix F

Table of Means and Standard Deviations

Proximity (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	24.88	5.74	16.63	11.98	16.88	20.73	2.13	2.80
Session 2	30.50	6.28	12.00	8.28	12.25	9.08	14.38	19.83

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	40.00	11.96	29.13	12.18	34.75	10.61	22.13	20.79
Session 2	25.88	16.65	34.25	8.63	27.75	19.90	18.00	13.11

Appendix F

Table of Means and Standard Deviations

Visual Regard (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.88	1.73	7.13	4.45	10.63	8.58	9.50	12.36
Session 2	2.13	2.10	2.75	2.31	9.13	8.06	4.00	4.00

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.25	1.98	6.25	3.92	6.50	6.00	2.38	2.33
Session 2	1.25	1.49	6.38	5.58	7.50	3.93	3.88	3.52

Appendix F

Table of Means and Standard Deviations

Withdraw (child-directed)

Younger Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.00	2.98	3.38	3.02	2.25	2.49	0.75	0.89
Session 2	3.75	1.98	1.50	1.20	2.13	3.09	2.12	2.10

Older Age Level

Group	Twin				Singleton			
Object	Twin		Singleton		Twin		Singleton	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.00	2.51	1.75	1.16	2.38	3.42	0.87	2.10
Session 2	1.25	1.28	1.00	0.93	1.75	2.25	1.50	1.69

Appendix G

ANOVA Summary Table
Behavior Category: Carry Object

Source	Df	SS	F
BLOCK	7	1692.11	4.15***
AGE	(1)	708.89	12.17***
GROUP	1	0.02	0.00
BLOCK x GROUP	7	436.36	1.07
AGE x GROUP	(1)	172.27	2.96
SESSION	1	34.52	1.23
BLOCK x SESSION	7	195.86	2.10
AGE x SESSION	(1)	15.02	1.13
GROUP x SESSION	1	8.27	0.62
BLOCK x GROUP x SESSION	7	373.11	4.01**
AGE x GROUP x SESSION	(1)	0.39	0.03
SUBJECT (BLOCK x GROUP)	16	931.75	
MODEL	47	3671.98	5.88***
ERROR	16	212.75	
TOTAL	63	3884.73	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Crawl

Source	Df	SS	F
BLOCK	7	21.75	1.33
AGE	(1)	6.25	2.67
GROUP	1	1.00	0.48
BLOCK x GROUP	7	14.50	0.88
AGE x GROUP	(1)	0.25	0.11
SESSION	1	0.06	0.02
BLOCK x SESSION	7	21.44	1.78
AGE x SESSION	(1)	0.06	0.04
GROUP x SESSION	1	5.06	2.09
BLOCK x GROUP x SESSION	7	16.94	1.41
AGE x GROUP x SESSION	(1)	0.06	0.04
SUBJECT (BLOCK x GROUP)	16	37.50	
MODEL	47	118.25	1.46
ERROR	16	27.50	
TOTAL	63	145.75	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table

Frown/Cry

Source	Df	SS	F
BLOCK	7	316.19	6.05***
AGE	(1)	132.25	17.71***
GROUP	1	30.25	0.85
BLOCK x GROUP	7	250.00	4.75***
AGE x GROUP	(1)	27.57	3.69*
SESSION	1	68.06	3.15
BLOCK x SESSION	7	151.19	1.73
AGE x SESSION	(1)	42.25	3.39*
GROUP x SESSION	1	49.00	2.54
BLOCK x GROUP x SESSION	7	135.25	1.55
AGE x GROUP x SESSION	(1)	39.06	3.13*
SUBJECT (BLOCK x GROUP)	16	119.50	
MODEL	47	1119.44	1.91*
ERROR	16	199.50	
TOTAL	63	1318.94	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Manipulate Object

Source	Df	SS	F
BLOCK	7	5137.11	4.86***
AGE	(1)	1838.27	12.18***
GROUP	1	1434.52	16.85***
BLOCK x GROUP	7	596.11	0.58
AGE x GROUP	(1)	23.77	0.58
SESSION	1	0.77	0.01
BLOCK x SESSION	7	931.36	0.90
AGE x SESSION	(1)	147.02	1.00
GROUP x SESSION	1	102.52	1.00
BLOCK x GROUP x SESSION	7	715.61	0.70
AGE x GROUP x SESSION	(1)	97.52	0.66
SUBJECT (BLOCK x GROUP)	16	2414.25	
MODEL	47	11332.23	1.64
ERROR	16	2353.25	
TOTAL	63	13685.48	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Manipulate Self

Source	Df	SS	F
BLOCK	7	168.50	1.21
AGE	(1)	20.25	1.02
GROUP	1	12.25	0.35
BLOCK x GROUP	7	244.00	1.75
AGE x GROUP	(1)	0.25	0.01
SESSION	1	14.06	2.02
BLOCK x SESSION	7	48.69	0.54
AGE x SESSION	(1)	0.66	0.00
GROUP x SESSION	1	18.06	1.09
BLOCK x GROUP x SESSION	7	116.19	1.30
AGE x GROUP x SESSION	(1)	10.56	0.82
SUBJECT (BLOCK x GROUP)	16	319.00	
MODEL	47	940.75	1.56
ERROR	16	205.00	
TOTAL	63	1145.75	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Oral Contact With Object

Source	Df	SS	F
BLOCK	7	621.69	6.80***
AGE	(1)	169.00	12.94***
GROUP	1	7.56	0.14
BLOCK x GROUP	7	356.69	4.00**
AGE x GROUP	(1)	12.25	0.94
SESSION	1	2.25	0.35
BLOCK x SESSION	7	2.25	0.46
AGE x SESSION	(1)	0.06	0.01
GROUP x SESSION	1	2.25	0.61
BLOCK x GROUP x SESSION	7	26.00	0.75
AGE x GROUP x SESSION	(1)	10.56	2.44
SUBJECT (BLOCK x GROUP)	16	209.00	
MODEL	47	1278.94	5.51***
ERROR	16	79.00	
TOTAL	63	1357.94	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Oral Contact With Self

Source	Df	SS	F
BLOCK	7	46.73	0.73
AGE	(1)	8.27	0.90
GROUP	1	8.27	1.85
BLOCK x GROUP	7	31.36	0.44
AGE x GROUP	(1)	1.27	0.14
SESSION	1	8.27	0.67
BLOCK x SESSION	7	87.86	1.20
AGE x SESSION	(1)	11.39	1.12
GROUP x SESSION	1	0.39	0.06
BLOCK x GROUP x SESSION	7	42.73	0.60
AGE x GROUP x SESSION	(1)	0.14	0.01
SUBJECT (BLOCK x GROUP)	16	147.25	
MODEL	47	370.89	0.77
ERROR	16	163.25	
TOTAL	63	534.11	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Sit

Source	Df	SS	F
BLOCK	7	15727.11	7.96***
AGE	(1)	10583.27	37.47***
GROUP	1	1670.77	4.14*
BLOCK x GROUP	7	2826.11	1.43
AGE x GROUP	(1)	9.77	0.03
SESSION	1	0.02	0.00
BLOCK x SESSION	7	490.36	0.29
AGE x SESSION	(1)	141.02	0.58
GROUP x SESSION	1	102.52	0.63
BLOCK x GROUP x SESSION	7	1136.86	0.66
AGE x GROUP x SESSION	(1)	17.02	0.07
SUBJECT (BLOCK x GROUP)	16	4518.75	
MODEL	47	26472.48	2.30**
ERROR	16	3922.75	
TOTAL	63	30395.23	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table

Smile/Laugh

Source	Df	SS	F
BLOCK	7	213.69	1.77
AGE	(1)	5.06	0.49
GROUP	1	3.06	0.17
BLOCK x GROUP	7	128.69	1.77
AGE x GROUP	(1)	25.00	2.41
SESSION	1	5.06	0.33
BLOCK x SESSION	7	107.69	12.95***
AGE x SESSION	(1)	4.00	3.37*
GROUP x SESSION	1	4.00	0.30
BLOCK x GROUP x SESSION	7	93.25	11.22
AGE x GROUP x SESSION	(1)	5.06	4.26*
SUBJECT (BLOCK x GROUP)	16	166.00	
MODEL	47	720.75	12.91***
ERROR	16	19.00	
TOTAL	63	739.75	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Squat

Source	Df	SS	F
BLOCK	7	1211.44	1.33
AGE	(1)	517.56	3.98*
GROUP	1	175.56	0.45
BLOCK x GROUP	7	2742.44	3.01**
AGE x GROUP	(1)	60.06	0.46
SESSION	1	36.00	1.00
BLOCK x SESSION	7	252.50	0.60
AGE x SESSION	(1)	121.00	2.02
GROUP x SESSION	1	100.00	0.41
BLOCK x GROUP x SESSION	7	1690.50	4.20**
AGE x GROUP x SESSION	(1)	156.25	2.60
SUBJECT (BLOCK x GROUP)	16	2081.00	
MODEL	47		
ERROR	16		
TOTAL	63		

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Stand

Source	Df	SS	F
BLOCK	7	12211.00	6.99***
AGE	(1)	6889.00	27.60***
GROUP	1	1660.56	14.48***
BLOCK x GROUP	7	802.94	0.46
AGE x GROUP	(1)	0.56	0.00
SESSION	1	100.00	0.89
BLOCK x SESSION	7	789.00	0.59
AGE x SESSION	(1)	324.00	1.70
GROUP x SESSION	1	1.56	0.03
BLOCK x GROUP x SESSION	7	429.94	0.32
AGE x GROUP x SESSION	(1)	33.06	0.17
SUBJECT (BLOCK x GROUP)	16	3993.50	
MODEL	47	19988.50	2.24*
ERROR	16	3041.50	
TOTAL	63	2303.00	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table

Verbalize

Source	Df	SS	F
BLOCK	7	1713.75	1.37
AGE	(1)	855.56	4.77**
GROUP	1	7.56	0.02
BLOCK x GROUP	7	2575.94	2.05
AGE x GROUP	(1)	110.25	0.61
SESSION	1	240.25	5.17*
BLOCK x SESSION	7	325.25	0.53
AGE x SESSION	(1)	162.56	1.84
GROUP x SESSION	1	248.06	2.43
BLOCK x GROUP x SESSION	7	714.94	1.16
AGE x GROUP x SESSION	(1)	1.00	0.01
SUBJECT (BLOCK x GROUP)	16	2869.50	
MODEL	47	8695.25	2.10*
ERROR	16	1410.50	
TOTAL	63	10105.75	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table

Vocalize

Source	Df	SS	F
BLOCK	7	295.94	2.56*
AGE	(1)	225.00	13.61***
GROUP	1	60.06	0.60
BLOCK x GROUP	7	698.94	6.04***
AGE x GROUP	(1)	36.00	2.18
SESSION	1	210.25	5.06*
BLOCK x SESSION	7	290.75	2.28*
AGE x SESSION	(1)	217.56	11.94***
GROUP x SESSION	1	0.25	0.01
BLOCK x GROUP x SESSION	7	321.25	2.52*
AGE x GROUP x SESSION	(1)	5.06	0.28
SUBJECT (BLOCK x GROUP)	16	264.50	0.91
MODEL	47	2141.94	2.50
ERROR	16	291.50	
TOTAL	63	2433.44	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix G

ANOVA Summary Table
Behavior Category: Walk

Source	Df	SS	F
BLOCK	7	3282.61	6.04***
AGE	(1)	1251.39	16.11***
GROUP	1	1.89	0.02
BLOCK x GROUP	7	600.73	1.10
AGE x GROUP	(1)	172.27	2.22
SESSION	1	62.02	1.27
BLOCK x SESSION	7	343.11	2.60*
AGE x SESSION	(1)	11.39	0.60
GROUP x SESSION	1	8.26	0.19
BLOCK x GROUP x SESSION	7	306.36	2.32*
AGE x GROUP x SESSION	(1)	11.39	0.60
SUBJECT (BLOCK x GROUP)	16	1242.75	
MODEL	47	5847.73	6.60***
ERROR	16	301.75	
TOTAL	63	6149.48	

* $p < .10$
** $p < .05$
*** $p < .01$

Appendix H

Table of Means and Standard Deviations
Behavior Category: Carry Object

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	11.13	9.64	8.38	8.90
Session 2	14.13	9.69	10.25	7.03

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.00	2.39	6.13	7.24
Session 2	3.38	3.47	5.76	5.95

Appendix H

Table of Means and Standard Deviations
Behavior Category: Crawl

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.50	1.69	0.63	0.92
Session 2	1.13	1.13	1.25	1.58

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.13	1.73	1.38	2.13
Session 2	1.50	1.69	2.00	1.07

Appendix H

Table of Means and Standard Deviations

Frown/Cry

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.00	1.69	1.63	2.45
Session 2	8.00	10.80	2.00	2.33

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	0.63	1.19	0.13	0.35
Session 2	1.63	3.02	0.38	0.74

Appendix H

Table of Means and Standard Deviations
Behavior Category: Manipulate Object

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	59.88	16.66	46.63	24.67
Session 2	58.13	13.38	54.88	10.95

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	72.38	4.84	61.63	10.65
Session 2	69.50	6.02	58.88	9.05

Appendix H

Table of Means and Standard Deviations
Behavior Category: Manipulate Self

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.50	6.46	3.37	4.53
Session 2	1.75	1.98	4.38	4.27

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.75	5.12	5.50	4.96
Session 2	3.50	3.50	4.75	2.31

Appendix H

Table of Means and Standard Deviations
Behavior Category: Oral Contact With Object

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	3.62	6.61	3.25	4.50
Session 2	5.13	8.98	2.38	3.70

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	0.25	0.46	0	0
Session 2	0.25	0.46	0.88	2.47

Appendix H

Table of Means and Standard Deviations
Behavior Category: Oral Contact With Self

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.38	1.60	2.13	2.85
Session 2	1.00	1.77	2.25	5.20

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	0	0	0.38	1.06
Session 2	1.50	2.38	2.00	4.57

Appendix H

Table of Means and Standard Deviations
Behavior Category: Sit

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	38.00	22.92	32.13	22.69
Session 2	44.50	22.86	31.50	17.30

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	68.50	9.17	59.00	15.83
Session 2	67.00	9.13	54.50	17.82

Appendix H

Table of Means and Standard Deviations

Smile/Laugh

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	2.38	4.40	1.63	1.60
Session 2	2.50	4.14	1.63	2.45

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	1.75	1.68	2.38	2.56
Session 2	1.75	1.58	4.50	6.44

Appendix H

Table of Means and Standard Deviations
Behavior Category: Squat

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	17.75	13.04	13.50	10.46
Session 2	16.38	13.71	23.38	14.62

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	9.75	9.15	15.63	10.14
Session 2	9.13	10.20	13.75	13.53

Appendix H

Table of Means and Standard Deviations
Behavior Category: Stand

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	28.63	18.12	40.13	23.84
Session 2	27.75	15.36	32.00	21.36

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	5.00	1.51	13.25	11.61
Session 2	5.25	5.52	17.00	15.71

Appendix H

Table of Means and Standard Deviations
Behavior Category: Walk

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	16.50	12.71	12.00	10.94
Session 2	17.75	11.85	16.38	9.83

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.38	2.20	8.13	8.81
Session 2	5.63	4.13	9.13	6.63

Appendix H

Table of Means and Standard Deviations

Verbalize

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	12.25	10.01	11.88	11.38
Session 2	9.25	8.39	16.25	8.65

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	19.25	15.00	13.13	9.40
Session 2	22.13	15.03	24.38	17.24

Appendix H

Table of Means and Standard Deviations

Vocalize

Younger Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	10.13	9.28	10.13	10.25
Session 2	3.25	2.71	2.38	1.92

Older Age Level

GROUP	TWIN		SINGLETON	
	Mean	Standard Deviation	Mean	Standard Deviation
Session 1	4.75	4.06	0.63	0.74
Session 2	4.13	4.08	1.38	2.00

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Bobbin, R. P., May, J. G., & Lemoine, R. L. Effects of pentobarbital and ketamine on brainstem auditory potentials, Archives of Otolaryngology, 1979, 105, 467-470.

PAPERS PRESENTED AT PROFESSIONAL MEETINGS:

Coon, R., Williamson, D. A., Lemoine, R. L., & Cohen, C. R. Environmental versus social interventions in treating a severely retarded child. Paper presented at the Meeting of the Southeastern Psychological Association, Washington, D.C., March, 1980.

Dreger, R. M., Lemoine, R. L., & Fuller, J. Behavioral classification projects - clustering entities measured on variables is not as easy as clustering variables. Paper presented at the Meeting of the Southeastern Psychological Association, Washington, D.C., March, 1980.

Dreger, R. M., Lemoine, R. L., & Fuller, J. Comparison of linear typal analysis with other clustering methods. Paper presented at the Meeting of the American Psychological Association, September, 1979.

Lemoine, R. L., May, J. G., & Porter, R. J. Auditory evoked responses to selectively attended speech. Paper presented at the Meeting of the Psychonomic Society, Washington, D.C., November, 1977.

Bobbin, R. P., May, J. G., & Lemoine, R. L. Effects of anesthesia on the latency of the early components of click-evoked potentials. Paper presented at the Meeting of the Acoustical Society of America, Austin, 1975.

Berlin, C. E., Mouney, D. F., Gondra, M. I., May, J. G., & Lemoine, R. L. Clinical experience in electrocochleography. Lecture presented at the 9th Colorado Medical Audiology Workshop, Ltd., Vail, Colorado, March 1-8, 1975.

Sweig, R., May, J. G., & Lemoine, R. L. Alpha biofeedback with high and low anxious subjects. Paper presented at the Meeting of the Southwestern Psychological Association, Houston, Texas, April, 1975.

Lemoine, R. L., May, J. G., & Kastin, A. Melanocyte-stimulating hormone and multimodal evoked potentials. Paper presented at the Meeting of the Southwestern Psychological Association, Houston, Texas, April, 1975.

Lemoine, R. L. Evidence of orientational selectivity in the human visual system. Paper presented at the Meeting of the Louisiana Academy of Sciences, Monroe, Louisiana, April, 1973.

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Title of Thesis: A Comparison of the Early Social Behavior of Twins and Singletons

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